ELECTRICAL WORLD

A consolidation of Electrical World, Electriael Engineer and American Electrician

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What in the World!

Now, when Mrs. Smith in Hartford writes her friend Mrs. Brown in Augusta about the new electric range she rented, it is quite evident that Mrs. Brown will write back and tell of the new electric water heater that she rents. This is personal publicity and good sales psychology. Both of these rental attempts are causing much comment and argument. Both are experimental and daring innovations. Results and not arguments or opinions will determine their merits. We commend the courage of Messrs. Ferguson and Williams in embarking upon these needed and promising experiments.

●

We wish more engineers of utility commissions would contribute articles. Their experience, broad contacts and point of view should be informative and constructive. In this issue Mr. Oldham presents an economic yardstick for evaluating line extensions. This is a vexatious problem for the industry as well as for commission engineers. Comment will be welcomed on the suggestion of Mr. Oldham.

●

We believe in co-operation and collective action. We believe this should start and function in each community and continue to the top structures in the electrical industry. Mr. Liversidge also believes in co-operation and suggests a way to bring this about. What do you think about his suggestions?

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We have the Century of Progress and several electrical conventions down on our calendar. Our plans call for some elaborate and interesting editorial services for this rallying place of electrical men. More later.

Opal glass in a Berlin interior

APRIL 1, 1933

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ELECTRICAL WORLD

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for the Week Ending

April 1, 1933

Roosevelt Seeks Control of Securities

RECOMMENDING to Congress the enactment of legislation which will provide federal supervision of traffic in investment securities in interstate commerce, President Roosevelt this week sent a special message to both houses. "The purpose of the legislation I suggest," pointed out the President, "is to protect the public with the least possible interference to honest business."

"This is but one step in our broad purpose of protecting investors and depositors," he continued. "It should be followed by legislation relating to the better supervision of the purchase and sale of all property dealt in on exchanges and by legislation to correct unethical and unsafe practices on the part of officers and directors of banks and other corporations. What we seek is a return to a clearer understanding of the ancient truth that those who manage banks, corporations and other agencies handling or using other people's money are trustees acting for others."

Bill introduced quickly

Even before the brief message from the President had been read to Congress a bill was placed in Senate and House leaders' hands which was soon characterized as a national "blue sky law." It is to be followed shortly by two others seeking to provide further protection for investors and depositors. The first measure has largely to do with the issuance of new securities.

Wall Street, inured to the prospect of the restrictions and reforms of a new era, expressed little apprehension over the proposed program and measures. Fewer new issues are foreseen as a direct result and some benefits cited. Investment trusts find complications.

▼

Wisconsin Telephone Case Remanded by Supreme Court

Criticising the U. S. District Court for the Western district of Wisconsin for its failure to present the facts upon which it based the decision to grant the Wisconsin Telephone Company an interlocutory injunction restraining the enforcement of the state commission's order reducing rates by 12½ per cent (ELECTRICAL WORLD, November 5, page 612), the U. S. Supreme Court has remanded the case for further finding of facts. The lower court granted the injunction on the grounds that the rates prescribed by the order would result in the confiscation of the property of the company and would deprive it of its property without compensation and without due process of law.

In handing down the opinion of the Supreme Court Chief Justice Hughes said in part: "No opinion was rendered by the district court, and, apart from the general statement above mentioned, the court made no findings. Not only did the court fail to set forth the facts pertinent to a conclusion that an interlocutory injunction should issue, but the court declared that the prescribed rates were confiscatory without any findings warranting such a conclusion . . . We have repeatedly emphasized the importance of a statement of the grounds of decision, both as to facts and law, as an aid to litigants and to this court . . . That duty the court below failed to perform in the instant case and we are not called upon, unaided by opinion or findings, to search this voluminous record to find a basis for the court's decree. The decree is accordingly vacated and the case is remanded to the district court, as specially constituted, for findings and conclusions appropriate to a decision upon the application for an interlocutory injunction, the temporary restraining order to remain in force pending that determination."

▼

Canadian Court Delays Martin Insull Hearing

Free again under $5,000 bail, Martin J. Insull returned last week to his home in Orillia, Ontario, after the Supreme Court of Ontario adjourned indefinitely the application for his extradition to Chicago. Justice Kingstone refused to order Mr. Insull's deportation on the basis of depositions of evidence taken in Chicago in support of the warrant under which he was arrested. The judge will study the depositions before a date is set for resumption of the hearing. Edward Bayly, acting for Illinois, claimed a *prima facie* case for deportation had been established and argued that this was all that was necessary under the Canadian law. Mr. Insull's attorneys charged bad faith and suppression of facts in the depositions secured in Chicago, arguing that evidence had been suppressed which showed no such crime as was charged against him had been committed. The judge gave the defense permission to produce any witnesses required.

Approximately 21,000 claims had been filed March 22, the dead-line date, against the bankrupt investment trusts, the Corporation Securities Company and the Insull Utility Investments, Inc. In commenting on what he called "the tragedy of the century," Garfield Charles, federal referee in bankruptcy, said: "Unless the trustees for these two Insull companies succeed in recovering the moneys they claim are held by Chicago and New York banks, and succeed in collecting from the officers and directors of the two companies, creditors will receive less than 1 per cent in dividends."

Oregon Regulatory Law Limited by Joker Clause

Oregon's new regulatory bill, finally approved by both houses of the Legislature (ELECTRICAL WORLD, March 25, page 372), but altered almost beyond recognition, has been filed by the Governor without his signature and will become part of the state regulatory code about June 8.

Commissioner Thomas's victory is a hollow one, however, for the section defining a public utility for the purposes of the act went into this qualifying and invalidating joker "shall not apply . . . in cities of less than 50,000 population . . . for the production, transmission, delivery or furnishing of heat, light, water or power." This means that Oregon's one-man commission, unless there are delays due to court mandates or the filing of referendum petitions, will have control in June over telephone and telegraph utilities throughout the state, but as to other public utilities will be limited to Portland, the one Oregon city which can claim to have a population of more than 50,000.

Certain major investigations now under way will presumably cease upon the law becoming effective. These are a blanket probe of the valutions of properties of the California Oregon Power Company and the southern Oregon holdings of the Mountain States Power Company and the completion of the investigation of rates and property evaluations of the Tillamook unit of the latter.

▼

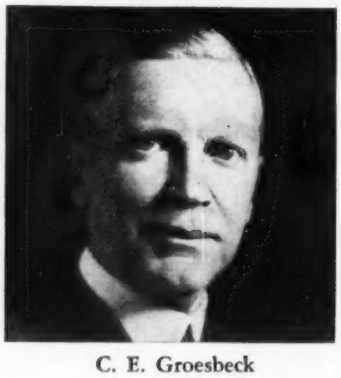
Mitchell Resigns from Bond & Share

SIDNEY Z. MITCHELL has retired from the utility business because of continued ill health. One of the last of that hardy, indomitable, tireless group of pioneering individualists of vision and action who brought electric light and power to the world, he has at 71 relinquished to other hands all his offices and directorates with the great billion-dollar group of Electric Bond & Share properties. His place as chairman of the board has been taken by C. E. Groesbeck, until now president. Mr. Groesbeck has been succeeded by S. R. Inch, formerly executive vice-president.

Sidney Z. Mitchell

Mr. Mitchell, identified with the electric light and power industry for nearly 50 years, has been in poor health for some time and only recently underwent an operation, from which he is successfully but slowly convalescing. He is, on the advice of his physicians, giving up all business activities. It is related that at an early age, his parents having died before he was twelve, his grandmother gave him an acre of ground and a mule and told him that while she would feed him and give him a comfortable place to sleep anything else that he wanted would have to be earned with the acre of ground and the mule. His has ever been just that sort of individualistic resourcefulness. He worked his way through a neighborhood country school and a preparatory school at Columbus, Ga. Graduated from the United States Naval Academy at Annapolis. Assisted in the installation of electric lights upon the battleship *Trenton*, the first battleship to be so lighted. He resigned from the navy, inspired by the possible future of electric developments, and went to work in the Pearl Street station of Thomas A. Edison.

In 1885 he went to Seattle, Wash., with an Edison license and remained in the Northwest for twenty years, building, operating and financing electric plants. He built the first central station incandescent lighting plant west of the Rocky Mountains. In 1905 he returned to New York and participated in the organization of the Electric Bond & Share Company, which originally consisted of properties assembled by the General Electric Company in order to hold stocks and bonds received from public utilities in exchange for equipment in a period when financing of power companies was difficult. It eventually developed that other groups of holding companies were formed to own the properties purchased by Bond & Share. General Electric in 1925 distributed all its stock holdings in Bond & Share to its stockholders, thus separating the two organizations completely.



C. E. Groesbeck

In addition to his chairmanship of Bond & Share Mr. Mitchell on his retirement was chairman of the American & Foreign Power Company, the American Gas & Electric Company, American Power & Light Company, Electric Power & Light Corporation, the National Power & Light Company and several of their respective subsidiaries. He was a director of the American Superpower Corporation, the Commonwealth & Southern Corporation, International General Electric Company, Irving Trust Company, Postal Telegraph & Cable Corporation and other organizations.

Groesbeck now president

C. E. Groesbeck, who succeeds Mr. Mitchell, obtained his early experience with H. M. Byllesby & Company during eight years on their Pacific Coast properties. In 1915 he became vice-president and general manager of the Utah Power & Light Company and vice-president of the Utah Light & Traction Company and the Western Colorado Power Company. In his presidency of present Electric Bond & Share, assumed in 1929 after holding the vice-presidency of the predecessor company since 1927, he has also been president of several related organizations and director of many others. He was born in 1876 and graduated from the University of Michigan as a bachelor of engineering.

S. R. Inch was born in England, is 54 years of age, an American citizen, a graduate of Finsbury Technical College of London, has had wide experience in the operation of public utilities and has been associated with Bond & Share since 1912. He has been a vice-president of the company since 1924.

▼

Tax Increase Again Urged for California Utilities

Hearings on the question of raising the taxation of public utilities in California, discussed before the state Senate for the past month, were concluded last week after heated argument with representatives of public utilities on one side and revenue-seeking legislators on the other. Presentation of a report to the Legislature is expected in the near future.

Clyde L. Seavey, president of the California Railroad Commission, who has repeatedly declared himself in favor of legislative action (ELECTRICAL

WORLD, March 18, page 337), again told members of the Senate that it was their duty to increase utility corporation taxes. Senator Crittenden, one of the three members of the Senate committee investigating the railroad commission's efforts toward lowering the rate of return to utilities, took the position that any increase in taxes would be passed on to the consumer. Disagreeing with him sharply, Mr. Seavey maintained that the utilities absorbed most of the tax increase in 1921.

Unavoidable delays would attend any attempt of the commission to cut the rate of return below the 7 per cent fixed by the courts, said Mr. Seavey. "However," he added, "if the Legislature does not increase taxes, we will again go to the Supreme Court in an effort to lower the rate of return."

Mr. Seavey explained that while the United States Supreme Court had not upheld any rate cases in the last ten years yielding less than a 7 per cent return to the utility, he believed present economic conditions justified a lesser yield. The commission is aiming at a reduction to 6½ per cent, a reduction which would effect a total cut of $9,140,000 in rates of all utilities.

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Labor Jurisdiction Assumed by New York Commission

After previously expressing the opinion that "the commission has no jurisdiction except that which is expressly conferred" (ELECTRICAL WORLD, February 18, page 215), Chairman Milo R. Maltbie of the New York Public Service Commission, acting in the labor dispute case of the Brooklyn Edison Company, ruled this week that the regulatory body can act if the policies complained of affect the service given by the company or the rates charged by it.

April 12 has been set by the commission for hearings at which the investigation will be continued upon the complaint charging "arbitrary, unjust, unreasonable and unlawful methods and practices" by Brooklyn Edison in the handling of its labor affairs, which the commission now holds to come within its jurisdiction. This is said to be the first time that a commission has assumed such powers.

▼

Lamp Life and Prices Changed

Changes in the design of 75- and 100-watt lamps are announced by the Westinghouse Lamp Company and by the General Electric Company, which have also reduced the price of the two sizes to 20 and 25 cents respectively. Former list price, 35 cents. Both lamps now have a design life of 750 hours with a 4 per cent increase over the former lumen output.

Dictators Are All Right—If Strong Enough

Item by item Mr. Roosevelt continues to collect from a dazed and at least partially-reluctant Congress the powers which will enable him to do virtually as he wishes to meet conditions as they may arise. Those who criticise the successive enabling measures, passed without much of the familiar wrangle and pointless debate that has ever been the accepted privilege of the national legislators, fail to appreciate just that viewpoint. The President appears less interested at the moment in pushing specific programs than in gaining authority to meet various problems with notable freedom of action when Congressmen shall have had their pat on the head and been told to go home like the good little boys that they have every one been.

Those close to the administration are firm in their insistence upon the almost unbounded liquidity of the program. We will try things. If one does not work, another may. If the conservative thing is not successful in holding the tide of deflation, perhaps it will really become necessary to act in as radical a manner as the powers now being granted would allow. Failure, in the ultimate sense, will not be permitted. The unslaked thirst for definite, forced inflation on the part of misguided enthusiasts still constitutes the greatest menace to the ultimate recovery of sound conditions.

As if to confound the doubters, some indexes turned about this week. Energy production again heads unseasonably upward, narrowing the gap between figures for this year and last. Carloadings rose by 11,899 units to 449,110. Automobile output higher. Commodity and security prices have fitful periods of strength and weakness. General business barometers stand at a new low. Steel production at about 15 per cent of capacity.

America is willing to be shown that opportunity lies just ahead for a conservative recovery. Boom times are unthinkable. Further serious declines are improbable. But if there is to be a celebration of thanksgiving for tangible and positive blessings gained it may better be looked for in the early fall than in the mild exuberance of a late spring.

Associated Assailed by Trade Examiner

THOUGH vigorously condemning the financial policy of the Associated Gas & Electric Company relative to its Pennsylvania group of properties, Judson C. Dickerman, engineer-examiner of the Federal Trade Commission, at a hearing last week paid tribute to its management and operating methods, both local and through holding company or construction organizations. "A fairly good operating system," he said, "barring some installations of doubtful advantage, is burdened with financial policies which in these days of depressed prices for commodities and labor does not look wholesome from either the consumer's or the ultimate investor's standpoint. The records of this group constitute an outstanding example of what may be done when a management desires to apply at its own discretion the extreme viewpoint on values which court decisions have tended to emphasize." Mr. Dickerman maintained that "the fixed capital account of the two hydro-electric projects (Youghiogheny Hydro-Electric Corporation and the Clarion River Power Company) are so extremely out of line with any reasonable possibility of actual costs, and even worse when the products of the plants are compared with costs of equivalent output obtainable from other available sources, as to leave no confidence that they mean anything except extreme inflation."

Also included in Mr. Dickerman's discussion were the Erie Lighting Company, the Pennsylvania Electric Company and the Johnstown Fuel Supply Company. "The local managements appeared experienced, alert and earnestly trying to maintain a good standard of service at as low cost to the company as possible," he said. "The supervision from the engineering, accounting and purchasing groups of the holding system, which charge fees for such services, appears actual and capable," he concluded.

At the conclusion of Mr. Dickerman's testimony, William A. Hill, counsel for the Associated Gas & Electric Company, moved to strike out his criticism of the financial structure, stating that the way had been paved by his company for scaling down of the book value of the company's Pennsylvania properties where they exceeded the reasonable ascertainable original construction cost. The motion was overruled.

U.G.I. tax charges denied

During the week James M. Bennett, public relations representative of the United Gas Improvement Company, criticized as unjustified and improper a statement made at a previous hearing before the Federal Trade Commission that the U.G.I. realized a profit of $9,300,000 from several stock-trading deals, upon which income tax was avoided (ELECTRICAL WORLD, March 25, page 370). "The whole transaction was investigated more than three years ago by the Internal Revenue Department," he said, "and it was ruled at that time that no tax was due on the trade, and that the income-tax laws had been fully complied with. . . . The fact that no tax was paid implies nothing irregular, and any innuendo or statement leading to such assumption is unfair and unjustified by the facts."

Coming Meetings

National Engineering Section, N.E.L.A.—Committee meeting, Detroit, Mich., April 3-7. B. F. Weadock, 420 Lexington Ave., New York.

Missouri Association of Public Utilities—St. Louis, Mo., April 27-28. N. R. Beagle, 101 West High Street, Jefferson City, Mo.

American Institute of Electrical Engineers—District meeting, Schenectady, N. Y., May 10-12. Summer convention, Chicago, Ill., June 26-30. H. H. Henline, 33 West 39th St, New York.

Electrochemical Society—Montreal, Que., May 11-13. Colin G. Fink, Columbia University, New York.

National Fire Protection Association—Milwaukee, Wis., May 29-June 1. A. R. Small, 109 Leonard St., New York.

Edison Electric Institute—Chicago, Ill., June 5-8. B. F. Weadock, 420 Lexington Ave., New York.

Canadian Electrical Association—Lucerne-in-Quebec, June 16-17. B. C. Fairchild, Power Building, Montreal, Que.

American Society of Mechanical Engineers—Chicago, Ill., June 26-30. C. W. Rice, 29 West 39th St., New York.

American Society for Testing Materials—Chicago, Ill., June 26-30. C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

Engineers' Day, Century of Progress Exposition—Chicago, Ill., June 28. G. E. Pfister, 308 W. Washington St., Chicago.

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New England N.E.L.A. Wind-Up

The liquidating committee of the New England division of the National Electric Light Association has voted to close the offices of the organization and wind up its affairs as soon as possible. Replies to a questionnaire sent to 172 member companies, of which but 22 have been received, show nineteen favoring a new organization and three opposing it. Sentiment in New England is quite widespread in favor of carrying on organization work, but executives of major properties are not ready for such a step at this time.

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San Joaquin Farmers Ask Rate Cut; Threaten Boycott

As the result of the refusal of the San Joaquin Light & Power Corporation to lower its rates for electrical energy supplied to agricultural customers in the San Joaquin Valley by a requested 25 per cent power users there have started to institute a boycott on electric service wherever it can be dispensed with. A. E. Wishon, president of the utility, has pointed out that such a reduction would be financially unwise, common dividends were not earned last year, and recounted that in less than a year rates have been slashed by $575,000 and special interim provisions have materially reduced the utility's income.

The utility has arranged that agricultural consumers who are delinquent in bills for 1932 will be carried forward and that power will be supplied in 1933 upon payment of current monthly bills, and that the credit department will analyze each individual credit application and will work with the applicant in obtaining credit from any source available or in extending credit where that is justified.

In spite of these concessions, the boycott leaders insist a reduction should be made and are proceeding in an effort to secure funds from the R.F.C. or some other federal agency with which to purchase Diesel or natural gas engines. A newcomer, the Natural Gas Service Company, owning wells in Kettleman Hills, has an offer purporting to furnish gas at a rate which will "insure farmers of a saving of as much as 65 per cent of present electric power charges for irrigation purposes." One of the proposals of the company is to pump irrigation water by means of gas lifts. It claims to have 35,000 hp. already signed.

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Committees Ask Continued Activities as N.E.L.A. Sales Section Expires

FINIS was written for the National Sales Section, N.E.L.A., at its meeting in Chicago, March 21-22. At a general convocation of all present on the morning of the first day G. E. Whitwell instructed the committee chairmen and members that their duties were to clean up as much pending work as was possible in their short remaining life of one day and to weigh carefully the value of their activities and interests to the end that such recommendations as they made for continuance of specific activities by the Edison Electric Institute should be based rigorously on the importance and value of them to the whole electric utility industry. He announced that the executive committee of the section would receive the reports and recommendations of the committee the next day and would then discharge them. It was announced also that the National Cookery Council and the Electric Refrigeration Bureau would be continued with the participation of the Edison Electric Institute in their activities.

Recommendations by the expiring committees for commercial work to be continued by the Institute were, briefly:

Commercial and Industrial Lighting Committee—Would complete revision and elaboration of wiring specifications to be used as guide for building specification writers. There is a large demand waiting for this book, which requires only a little more work for completion. Continuation of survey of wiring conditions in collaboration with Association of Building Owners and Managers. Publication of data on sales methods and sales problems already collected. Continuation of survey of industrial lighting conditions, from which a tabulation covering 400 industrial plants has already been made.

Industrial Heating Committee—Would have its work in education of salesmen, preparation of articles on industrial heating and timely publicity on particular developments continued by the Institute.

Home Appliance Committee—Reports on home-heating devices and domestic laundry equipment now ready for publication. Asked that studies be continued on industry co-operation, financing of merchandise sales through dealers, laboratory approval of appliances and developments and promotion of appliance sales.

Industrial Power Committee—Recommended continued study of service to pipe line pumping and that contact and association with the American Society of Mechanical Engineers in the collection of cost data on Diesel engine operation should continue. Power sales manual now in preparation should be completed. Space should be given in monthly publication of Edison Electric Institute to printing synopses of articles in current technical periodicals of interest to power salesmen. Possibilities of a correspondence course in power salesmanship should be investigated.

Home Air Conditioning and Water Heating Committee—Recommended publication of the report of home air conditioning, which is now ready. Committee had on hand a large amount of material for water heating report and asked that this material be brought up to date and published.

Women's Home Service Committee—Recommended continuation of activities now in progress; (1) Analysis of home service activities or representative companies; (2) preparation of outline for demonstration of various appliances and equipment; (3) preparation of educational material; (4) co-operation with other interested groups for the promotion of electricity use in the home.

Home Lighting Committee—Recommended that sales promotion efforts on the indirect portable lamp be continued.

Industrial Air Conditioning—Would see activities continued and data now collected studied and prepared for publication

Home Wiring Committee—Recommended that studies on (1) industry relations covering need for securing co-operation of contractors, manufacturers, distributors, (2) development of simplified wiring methods including means for their promotion and the assembly and dissemination of information on them, (3) partial-payment plan for domestic wiring, and (4) promotion of wiring adequacy be continued.

Commercial Cooking Committee—Two reports, one on commercial meat roasting and the other on commercial cooking sales plans, are now ready for the printer. They should be published.

Customers Service Committee—Recommended that preparation and publication of "Service Suggestions" that appeared in N.E.L.A. Bulletin be continued in monthly periodical of Edison Electric Institute.

Farm Service Committee—Sought formation of a group in the Institute to carry

on the work of this committee and that the work previously being done by the N.E.L.A. rural sales committee be consolidated with it.

Outdoor Lighting Committee—Recommended that activities for the promotion of street-lighting sales be continued and also studies and reports on dangers of curtailment of street lighting, highway lighting, outdoor sports lighting and exterior lighting of public buildings and residences.

The attendance at the meeting was not large, the total registration being something under 100. In the intervals between final reports rendered to the executive committee there was considerable discussion as to what would be the policy of the Edison Electric Institute in regard to commercial activities. It was impossible, of course, for any one present to speak authoritatively on this matter, but the general opinion appeared to be that adequate and sympathetic consideration would be given to the general sales problems of the industry by the operating committee of the Institute and that probably a commercial development organization would be set up somewhat similar to but smaller than the N.E.L.A. Sales Section. The point was raised as to the participation of manufacturers and it was generally conceded that they must play an essential part in whatever sales development work is carried on by the Institute.

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Utilities Cut Dividends to Meet New Conditions

Simultaneously with the appreciable weakness displayed recently by utility security prices there has been an epidemic of dividend cuts and omissions. Declining earnings have to a measure entered as definite causes of these results. Among the changes announced in dividends in the past few weeks were:

American Power & Light Company—Now 37½ cents per share for the quarter on $6 cumulative preferred stock, no par value, last payment 75 cents; 31¼ cents per share on $5 cumulative preferred stock, no par value, last payment 62½ cents.

Arkansas Power & Light Company—58 cents a share on $7 cumulative preferred stock, last payment $1.75; 50 cents per share on $6 cumulative preferred stock, last payment $1.50.

Carolina Power & Light Company—88 cents per share on $7 cumulative preferred stock, last payment $1.75; 75 cents per share on $6 cumulative preferred stock, last payment $1.50.

Cleveland Electric Illuminating Company—30 cents per share on common stock, no par value, last payment 40 cents.

Detroit Edison Company—1 per cent on capital stock, last payment 1½ per cent.

General Gas & Electric Company—Defers quarterly dividends of $1.50 on $6 cumulative preferred stock, series A, and $6 cumulative convertible preferred stock, series B; $1.75 on 7 per cent cumulative preferred and $2 on $8 cumulative preferred stocks. On January 1 last these distributions were made in scrip of the respective issues, carrying 7 per cent interest and redeemable in five years.

Mountain States Power Company—Defers quarterly dividend due April 20 on 7 per cent cumulative preferred stock, par $100, last payment 1 per cent.

Northern Indiana Public Service Company—87½ cents per share on 7 per cent preferred stock, last payment $1.75; 75 cents per share on 6 per cent preferred stock, last payment $1.50; 68¾ cents per share on 5½ per cent preferred stock, last payment $1.37½ cents.

Northern States Power Company—1 per cent on common stock, class A, last payment 1½ per cent.

Philadelphia Company—25 cents per share on common stock, no par value, last payment 35 cents.

Public Service Corporation of New Jersey—70 cents on common stock, last payment 80 cents. Salaries and wages of officers and employees reduced approximately 10 per cent April 1.

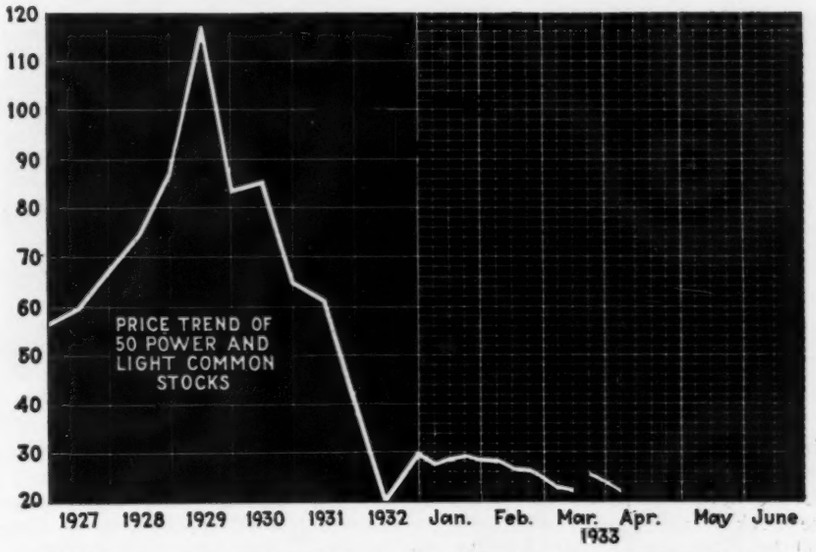
Standard Gas & Electric Company—Omits quarterly dividend on no-par common stock, last payment 30 cents.

Standard Power & Light Company—Omits quarterly dividend on common stock and common stock, series B, last payment 30 cents.

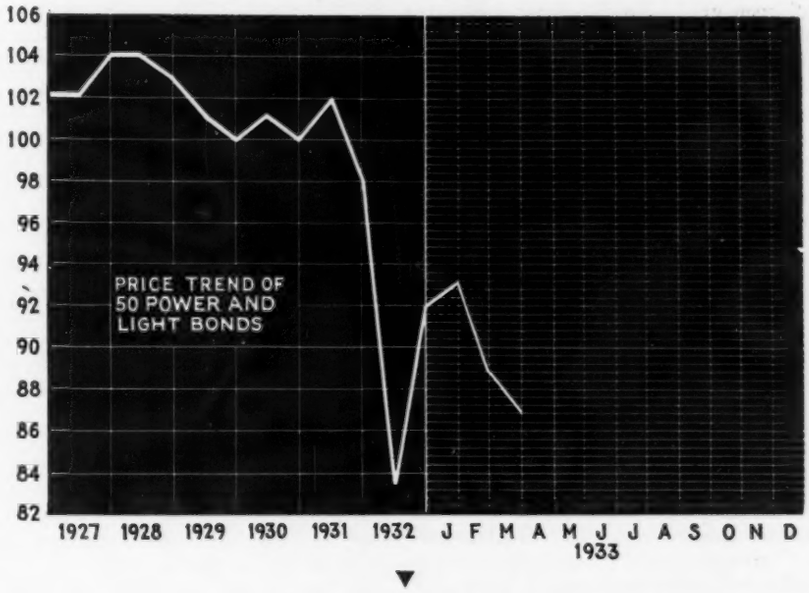
Utah Power & Light Company—Omits quarterly dividend on $7 cumulative and $6 cumulative preferred stocks of no par value, last payment $1.75 and $1.50.

Virginia Power & Light Company—88 cents per share on $7 preferred stock, last payment $1.75. 75 cents per share on $6 preferred stock, last previous quarterly payment $1.50.

Stocks and Bonds Lower in Dull Trading



Security markets, subjected to both pressure and indifference during the past week, sustained considerable losses. Electrical World's stock index receded from 23.5 to 21.7, while the bond index fell from 88.9 for February to 87.3 for March.



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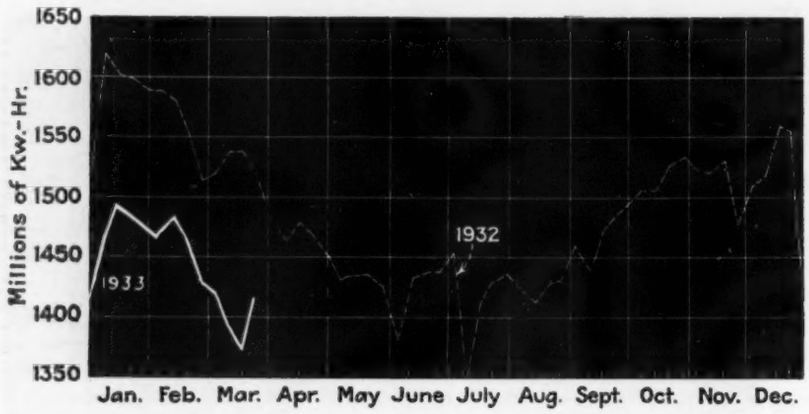
Factories Speed Up; Output Grows



Greater industrial activity is indicated by the increase of energy generated in electric light and power plants during the week ended March 25—1,409,655,000 kw.-hr., against 1,375,207,000 the week before (misprinted in last week's issue).

During the "bank holiday" period the deficiency compared with 1932, which had been gradually shrinking, expanded to 10.6 per cent. The gain of several months was apparently wiped out in two weeks. Now the new figures reduce the gap to 6.9 per cent. In contrast with a declining output last year, this year we have a rise.

All parts of the country responded to the stimulus, notably the industrial sections. On the Atlantic Seaboard the disparity in successive weeks dropped from 8.2 to 4.3 per cent, in the Central industrial area from 14.8 to 10.9.

Weekly Output, Millions of Kw.-Hr.

Week Ended	1933	1932	1931	1930
March 25	1,410	1,515	1,689	1,723
March 18	1,375	1,538	1,682	1,722
March 11	1,391	1,538	1,676	1,736
March 4	1,423	1,520	1,664	1,750
February 25	1,426	1,512	1,633	1,744

Per Cent Change from Previous Year

Region	Week Ended Mar. 25	Mar. 18	Mar. 11
Atlantic Seaboard	— 4.3	— 8.2	— 8.0
New England alone	— 7.6	— 9.5	—10.4
Central industrial	—10.9	—14.8	—14.4
Pacific Coast	— 4.1	— 6.9	— 5.8
United States	— 6.9	—10.6	— 9.6

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New Type Network Cable Subjected to Field Tests

Seventeen field tests with a new type of secondary network cable giving definite promise of improved performance were conducted in Springfield, Mass., March 23 and 24 in the presence of utility representatives. The cable, insulated with a special form of "Rockbestos" and covered with a lead sheath, was made up for test circuits of three No. 4/0 conductors and the same size bare neutral, prearranged with tight or loose faults near the center in one, two or three phases. It was subjected to short-circuit currents of 4,000 or 6,000 amp. (total) per phase. The circuits were energized from both ends in all but two tests. Most of the tests were conducted in tile, iron, fiber or soapstone underground ducts and iron-pipe risers, although a few were made in the open to allow observation of what occurs under short-circuit conditions.

Except when fiber duct was used and when a loose three-phase fault in iron duct caused considerable metallic vapor, there was but little evidence above ground of the clearing of the short circuits in the underground ducts. There were no explosions, no lifting of manhole covers and only slight wisps of white vapor around the manhole covers. Little manhole ventilation was required after faults with the exception mentioned.

In most cases the lead sheaths were melted off the cables up to the manhole joints and the copper strands were frequently welded solid inside the insulation, but the latter remained intact and firm except where the conductor itself had been ruptured. However, sections of the insulation were still found in tubular form even where the conductor had completely vaporized or melted and been ejected through the insulation.

The clean-cut ruptures and the toughness of the outer shell of insulation after the sheath had melted off were particularly striking. In several cases conductors ruptured without disturbing the insulation on adjacent conductors. Restriking of arcs which occurred before the faults completely cleared themselves were apparently due to copper vapor or the sheath lead that melted and collected in the bottom of the ducts.

It was evident from the tests that little smoke and no explosive vapors would be given off when the new cable is installed in ducts which themselves would not volatilize into combustible gases. However, it was also evident that loose faults would cause sufficient volatilization of copper to stimulate restriking of arcs. The tests were conducted by the Western Massachusetts Companies for the Rockbestos Corporation.

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Detroit Energy Use Up as Bank Situation Clears

Reflecting improvement in the local banking situation and other encouraging influences, both local and national, the power consumption in Detroit in three days increased more than 30 per cent, as compared with the corresponding three days of the previous week, following the announcement of the forming of a new bank.

The increase in power consumption was accompanied by other improvements. The value of building permits increased to $67,000 from the previous figure of $20,000, and the week's automobile delivery total in Wayne County jumped to 301, against 186 for the preceding week.

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Mercury Unit Operating in New Jersey Station

Public Service Electric & Gas Company has placed in operation the 20,000-kw. mercury-vapor turbine constructed for it by the General Electric Company. Inauguration of service began this week. The installation is at the Kearny generating station of the company.

This is the second commercial development of its kind, the first having been made by the Hartford Electric Light Company a number of years ago and subjected to various revisions and improvements during that time: a 10,000-kw. unit.

General Electric's own mercury-vapor unit, now being installed out of doors at Schenectady, will, it is anticipated, be in operation some time in May.

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Lehman Would Aid Municipals

In a special message to the Legislature this week Governor Lehman urged the enactment of a bill permitting municipalities to operate public utility plants and to sell electricity to their residents. The adoption of this legislation would create an alternative channel for the distribution of St. Lawrence power in the event that the Power Authority is unable to make satisfactory contracts with private utility companies for the transmission of St. Lawrence power through the state. Immediately after the Governor's message was received a bill embodying his recommendation was introduced in the Senate and in the Assembly.

Federal Power to Examine Costs of Five Projects

Hearings begun this week by the Federal Power Commission constitute the first of a series of four which will last for several months and presumably develop cost data regarding several recent hydro-electric projects.

This week the Waterville project on the Pigeon River in North Carolina, under license to the Carolina Power & Light Company, controlled by the Electric Bond & Share Company, will be examined. The purpose of this hearing is the determination of the actual legitimate cost of the project, the total cost claimed by the company being $13,764,856.51.

On April 4 the Power Commission will begin hearings on the cost of the Chelan project in Washington State, and two days later hearings on the cost of the Lewiston, Idaho, project, both owned by the Chelan Electric Company, a subsidiary of Electric Bond & Share Company, through the American Power & Light Company.

On April 17 the El Dorado, Calif., project of Pacific Gas & Electric Company and on May 1 the Oak Grove project of the Portland General Electric Company in Oregon, which belongs to the Central Public Service group, will be the subjects of new hearings which also relate to investment costs. Two other hearings will be held in April, but these concern adjustment of annual charges and determination of the value of headwater improvements on certain projects, all in California.

On May 15 the well-known Clarion River line will be again before the commission. This determination of the nominal cost of a power project in Pennsylvania was interrupted in October, 1930, by injunction proceedings instituted by the Clarion River Power Company, a subsidiary of the Associated Gas & Electric Company. However, this test of the Federal Power Commission's authority was successfully met in every court, so that the power company must now come under the jurisdiction of the Federal Power Commission.

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New Indiana Body Discusses State-Wide Rate Reductions

Indiana's new Public Service Commission's first action has been to discuss a state-wide utility rate reduction, involving possibly voluntary slashes by electric light and power companies in place of the allegedly minor adjustments and agreements that have been cluttering the commission's calendar. The commission is faced with the task of making preparation for hearings in scores of cities and towns or of bringing about rate adjustments by general statements of policy and encouragement of direct action.

Electric rate reductions cutting energy costs an average of 20 per cent for rural patrons of the Public Service Company of Indiana in 23 counties and three towns were approved by the commission. Petitions for the adjustments were filed by the company after agreements had been reached with the patrons.

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Young Leaves R.C.A. or G.E., Rules Attorney-General

Though unconcerned with which organization Owen D. Young might choose to remain associated, Attorney-General Cummings, upon recommendations by the U. S. Department of Justice, has declined to agree to a proposed plan under which Mr. Young might have been permitted to continue as a member of the board of both Radio Corporation of America and the General Electric Company. The Attorney-General has set April 21, the effective date of the decree providing for the reorganization of the corporations to prevent interlocking directorates and other affiliations, as the time for his retirement from one or the other.

G.E. takes R.C.A. Building

In the formal report of the General Electric Company indication is given of just how the $11,695,546 balance owed to the General Electric Company by the Radio Corporation of America for merchandise as of November 21, 1932, the date of the consent decree dissolving their intercorporate relationships, was made effective. It is stated: "As part of the new arrangement this indebtedness was satisfied by the conveyance to your company of the RCA Building, 570 Lexington Avenue, New York City, at $4,745,000, which was somewhat less than its assessed value; by the delivery to your company of $1,587,000 of Radio Corporation ten-year debenture bonds, and the balance of $5,363,546 by the rights and benefits accruing to your company under the new agreements. The decree further provides that certain matters relating to the foreign situation are reserved for further consideration."

Insull loans explained

Pointing out that the publicity accorded the General Electric Company's loans to Insull organizations had not been correct in some instances, the report clarified the situation as follows:

"Early in December, 1931, Samuel Insull requested loans of $2,000,000 for some of his companies. Mr. Insull was at the head of companies that had been good customers of your company for forty years, during which time their purchases of General Electric products had amounted to well over $100,000,000. Your company has, from time to time, made loans to other important customers. At the time the loans were made, the market value of the collateral was substantially in excess of the loans. At the end of the year the loans were included in assets at the market value of the collateral, which was approximately $313,000."

Statement of 1932 earnings, financial condition and business of General Electric appeared in ELECTRICAL WORLD, March 4, page 275.

Major New Construction This Week

Heavy-duty motors and controls, electric pumping machinery, transformers, compressors, etc., will be installed at refinery of Crown Central Petroleum Corporation, Houston, Tex. A $1,000,000 project.

General electrical equipment will be purchased for new plant of Rainier Brewing Company, Los Angeles, Calif., estimated cost $700,000.

General electrical equipment required for new plant of Liberty Brewing Company, Woodhaven, L. I., to cost about $400,000.

Los Angeles, Calif., soon takes bids for new power substation in Palms district. Cost over $125,000.

Motors, compressors, pumps, transformers, etc., will be installed in refineries at Marcus Hook, Pa.; Toledo, Ohio, and Yale, Okla., of Sun Oil Company, Philadelphia, Pa. Cost over $1,000,000.

General electrical equipment will be purchased by Houston (Tex.) Ice & Brewing Company, to cost about $225,000.

Fund of $524,870 has been approved by Water and Power Commission, Los Angeles, Calif., for extensions and improvements in city power system.

State Board of Affairs, Oklahoma City, Okla., plans steam-operated generating plant at State Penitentiary, Stringtown, to include ice plant. Cost about $100,000.

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Tennessee Would Reduce Rates

Seeking to secure rate reductions for railroad and utility service of at least 25 per cent, both branches of the Tennessee Legislature have adopted a resolution calling on the state Railroad and Public Utilities Commission to make an investigation to determine if such reductions are feasible.

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New York Metal Prices

	March 21, 1933 Cents per Pound	March 28, 1933 Cents per Pound
Copper, electrolytic	5.25	5.00
Lead, Am. S. & R. price	3.25	3.00
Antimony	5.95	5.95
Nickel ingot	35.00	35.00
Zinc, spot	3.50	3.40
Tin, Straits	24.00	24.375
Aluminum, 99 per cent.	23.30	23.30

Officers Leave Directorate

In reducing the number of directors of Stone & Webster, Inc., from twenty-two to fourteen last week the stockholders eliminated officers of the company and its affiliates. One of the reasons given by Charles A. Stone, chairman, was: "The membership of a board preferably should represent not only stockholders generally, but also a substantial personal investment in the corporation."

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Georgia Utility Bills Die

Some of Georgia's threats to the peace of mind of utility executives and security owners (ELECTRICAL WORLD, February 11, page 180) passed into nothingness last week when the legislative bodies of that state adjourned after 60 days of inaction. None of the bills introduced which would have in any way affected electric light and power company interests became a law. Relatively few utility measures were included in the 1,100 or so bills up for consideration.

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Meters Removed to Beat Flood

Continued rising of floodwaters of the Ohio River (ELECTRICAL WORLD, March 25, page 370) has not only forced prolonged shut-down of the hydro-electric generating station of the Louisville Gas & Electric Company at Louisville but last week led the utility to remove at least 300 watt-hour meters on customers' premises where the high water threatened to cause expensive and troublesome reconditioning jobs later unless forestalled.

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Inspectors Check Appliances

Sponsored by the electrical inspectors of New York City and Westchester County, a campaign to eliminate the sale of unapproved electrical devices and materials is getting under way. It is planned that, under a districting system, all manufacturers and dealers will be asked to check stocks to eliminate unapproved items.

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Appeal Permitted in Mitchell Case

Western Public Service Company has been granted permission by the Nebraska Supreme Court to appeal from its order naming three district judges to conduct proceedings to condemn its property in the city of Mitchell for municipal operation (ELECTRICAL WORLD, January 28, page 118). The appeal recites that the law under which proceedings were begun is invalid for the reason that it deprives the property owner of a trial by jury, thus denying equal protection of the law as guaranteed by the federal Constitution, and that in imposing certain expenses in connection with the condemnation, thus preventing the company from receiving full compensation, the company is denied due process of law.

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Foreign Power Wins in Chile

An increase in rates for the Cia Chilena de Electricidad, Ltda., Chilean subsidiary of American & Foreign Power Company, has been granted by presidential decree. The adjustment is to be made to compensate for the depreciation of the Chilean peso in terms of the American dollar. The increase will not affect small users. As reciprocal action the company has agreed to raise the compensation of all workers receiving less than 1,000 pesos a month by 20 per cent.

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Coin-In-Slot-Washers Expanding

Extending to other cities at a rapid rate the coin-in-the-slot washer idea (ELECTRICAL WORLD, December 31, 1932, page 872) is now effective in Washington, Philadelphia, Cleveland, Detroit, Indianapolis, Pittsburgh, Chicago, Spokane, Milwaukee and Kansas City. In the latter city more than 1,600 machines are available to various apartment house tenants. The usual rate is 25 cents an hour.

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Non-Tamperable Fuses in the Code

At the recent meeting of the electrical committee of the National Fire Protection Association it was decided to introduce section 804 into the National Electrical Code rendering permissible the use of plug fuses of the non-tamperable type fitting the standard fuse cutout base with a special adapter. They must, among other things, be of such a design as to be subject to tampering or bridging only with difficulty; shall have no live parts exposed when fully assembled, and the adapter, once installed, shall not be removable.

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Seek Parity with Municipals

Urging a special sales tax on gas and electricity, applicable to all producers in Canada, and with the same exemption in respect to income tax on the sale of these commodities as is enjoyed by publicly owned utilities, a delegation said to represent Montreal Light, Heat & Power Consolidated petitioned the Dominion government at Ottawa last week. Representing by a signed petition 100,000 users of gas and electricity in Montreal, this group asked that they be accorded the same advantages that accrue to customers of municipal enterprises which receive service free of income and other taxes.

Electrical Exports Decline

February exports of electrical machinery, according to the Bureau of Foreign and Domestic Commerce, showed a marked falling off. As reported, February involved $2,461,271 as compared with $3,085,903 in January and $4,344,256 in February of last year.

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Macon Facilities Not for Sale

Replying to an offer from the city authorities of Macon, Ga., to purchase the distribution system owned there by the Georgia Power Company, Preston S. Arkwright, president, has announced that his company will not part with its facilities. Mr. Arkwright also warned of the heavy losses and higher taxes which sometimes follow municipal plant adoption. Macon City Council recently voted to purchase or build a city-owned power plant and system.

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Independent Audits Urged

Asking of the Legislature of New York that "the impending utility legislation be as comprehensive as that proposed by the utility companies," Arthur H. Carter, president of the New York State Society of Certified Public Accountants, has sent a message to Governor Lehman backing his plea for new legal measures, but specifically urging the "audit of the financial condition and operations of all utility companies by independent firms of certified public accountants qualified under the laws of some state." They should apply equally to municipally and privately owned utilities.

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U. S.-Mexico Power Project

Reporting upon the joint survey by engineers representing the United States and Mexican governments, W. E. Anderson, engineer of the International Boundary Commission, states that Rio Grande hydro-electric power potentialities incidental to water storage project at the first dam proposed would yield sufficient income to place the entire development upon a self-liquidating basis. According to Mr. Anderson, the average power head of the proposed dam at Roma would be 36 ft. and the minimum flow 3,000 second-feet. This would give a capacity of 18,000 hp. About 400,000 acre-feet would be impounded.

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Another 35,000-Volt Generator

The Electricity Commissioners of South Africa have ordered a second 20,000-kw., 35,000-volt turbo-generator to be installed in the Salt River station at Cape Town. This is the second three-phase unit purchased from C. A. Parsons & Company for this plant.

British Columbia Utility Gains Ranges and Heaters

From a comparative standstill, sales of electric ranges in British Columbia have jumped to the highest point in the past two years as a result of an unusual merchandising plan developed by British Columbia Electric Railway for the dual purpose of relieving unemployment and increasing load. For the time the plan is in effect ranges will be installed free, while water heaters and their installation will be donated by the company. No matter whether the sale is by a B. C. Electric store or by an electrical dealer, B. C. Electric foots the bill in all cases.

As the company has a gas department, the same offer is made on gas ranges and water heaters, which many electrical firms in Vancouver also handle. However, the offer does not apply in the cases where the installation of an electric range would replace gas, or vice versa. Nor will electric water heaters be given free and installed except where an electric range is purchased or already installed.

While the "free" offer applies only to home owners, tenants can obtain the benefit by paying the regular cost of the range installation, or the cost of the water heater and installation, in installments, these being guaranteed by the owner. At the end of two years, if range and water heater have been in continuous service, the entire cost is refunded by the utility. The electric heaters may be disconnected in winter when the furnace coils are in use, it is provided.

Free water heater plan

Water heater sizes are determined by the size of the family, a small family being provided with a 750-watt, immersion-type heater costing $3 a month to operate and a larger family taking the 1,000-watt unit costing $4 a month. Not only will the central station supply heaters free to dealers to donate to approved customers, but it also pays a commission to the dealer, $1.25 for a 1,000-watt heater and 75 cents for a 750-watt unit. In buying a range, either from utility or dealer, 5 per cent down payment is required and the balance spread over 30 months.

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One-Twentieth Horsepower Sufficient for Refrigerators

Frigidaire is out to get its full share of the late depression markets of 1933 with a radically new principle of refrigeration which brings operating costs for domestic units to new low levels.

As announced last week the compressor now installed in the popular-priced models utilizes but a 1/20-hp. motor and a refrigerant, dichlorotetrafluero-ethane, alleged to be odorless, non-toxic, non-irritating, non-inflammable, non-corrosive and harmless to non-metallic goods.

The new three-part rotary compressor is said to be an improvement both as to absence from vibration and noiselessness. Refrigerant flow to the evaporator is now controlled by a new device designated as a "restrictor." "Stataflex" insulation is used. The new compressor principle is only incorporated in the $96 and $138 models.

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Improved Street Lighting With Gas-Discharge Lamps

England appears to be taking street lighting quite seriously at the moment, and with notable success. Following the trial installation near the General Electric laboratories near Wembley, England (ELECTRICAL WORLD, November 26, 1932, page 713), a new practical and advanced development has been made for a stretch of more than a mile on Watford Road, Wembley.

Inclosed in a most unusual and attractive decorative fixture of dust-proof, diffusing and permanent construction, the new sources offer high efficiencies, improved distribution and better roadway illumination. They are not of the monochromatic type used in the earlier installation, but are of the double-envelope type and offer greatly improved color characteristics. They consist of two electrodes at opposite ends of a tubular bulb inclosed in a vacuum jacket, connections being made through a standard screw base. The only auxiliaries, a choke and condenser, are housed at the base of the lamps. The luminous area is about 6 in. long and ¼ in. in diameter. Operation is at a power factor of 0.83.

Including the losses in the choke the efficiency of this source is 38 lumens per watt, as compared with 15½ lumens per watt for tungsten gas-filled lamps of similar wattage, in this case 420. The life of the gaseous-discharge lamps and of tungsten-filament lamps is said to be the same. The light curve characteristics are such that street lighting problems are notably simplified. More than double the amount of light is said to fall on the roadway than would be given by a tungsten lamp of equal wattage in an efficient asymmetric reflector lantern or six times that obtained with a filament lamp inclosed in an ordinary opal decorative fitting. The lamps may be operated from any 230-250-volt alternating-current circuit.

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Shanghai Bright by Night

Wide World

Along the Nanking Road in Shanghai, China, familiar elements of occidental lighting practices are to be found; advertising signs, floodlighting, window displays, street lighting, neon tube displays, etc., adapted to the oriental style.

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Insect Trap Proves Efficacious

Installed in the Rhone Valley in France, a newly developed mosquito trap utilizing ultra-violet light to attract the insects and a fan-induced suction to draw them into a trap receptacle is reported tc have demonstrated its efficiency to the extent of 150,000,000-insect captures in three weeks. It is said that a relatively small installation about 5 ft. tall and 1 ft. in diameter will prove effective over many acres.

EDITORIALS

L. W. W. MORROW
Editor

The retirement of S. Z. Mitchell

IN THE retirement of Sidney Z. Mitchell there passes out of the active life of the power industry one of its most prominent and picturesque personalities—another of those highly individualistic pioneers whose creative leadership has made history in the electrical world through the last half century. After protracted ill health and a month in the hospital, Mr. Mitchell wisely steps out of the harness, that he may lengthen his days, with the rest to which his long life of intense activity has entitled him.

Because of the part that he has played in its affairs, Mr. Mitchell's career emphasizes again the dramatic progress of this great industry, grown from its beginning in the span of a single generation. As a young naval officer he was captivated by the romantic possibilities of electricity. He went to work for Thomas A. Edison, and in 1885, with an Edison license in his pocket, left for the far West to plant the electrical idea in that new country. For twenty years he built, operated and financed electric plants throughout the Northwest and British Columbia, returning in 1905 to assist in the organization of the public utility operating system of the Electric Bond & Share Company. He has been its active head ever since.

Mr. Mitchell was born on an Alabama farm and he went to work at twelve years old, an orphan, with one mule as working capital. Out of this background he has centered his interest on the rural community and the farm home and has probably done more to bring electric service into isolated lives than any other man. Even in the development of the many properties of the American & Foreign Power Company in Latin America and the Far East, conceived as a broad program for building markets for American capital, engineering talent and electrical products, this same interest has been reflected in the aggressive extension of lines out from the cities into the rural areas.

And the same purpose was indirectly furthered by the first impulse he gave to interconnection, when he was called to Washington early in the World War to help solve the problem of finding more power for industry without building new generating stations. He suggested interconnecting those plants with excess capacity with those that were overloaded. And these transmission lines, of course, carried the service into new territory.

S. Z. Mitchell has been a builder as well as a blazer of new trails. He has had broad vision and a great accomplishment. He is fortunate in the privilege of planning for his succession and seeing installed as chairman and president of his far-reaching organization C. E. Groesbeck and S. R. Inch, two strong men of his own raising, whose ideals have been fired at his torch. The selection of Mr. Inch as president, out of an essentially operating background, is interesting in view of present trends.

Liversidge throws his hat in the ring

HORACE LIVERSIDGE, speaking before the New York Electrical Association, has raised the banner for a new "council of the electrical industry" to co-ordinate the policies of the four national associations. He also sees in it an agency for use in the organizing and conduct of market development activities in which all branches of the industry are concerned. He has thrown his hat in the ring and announced his intention to fight for the immediate establishment of such a council.

The idea is well timed and well sponsored under Mr. Liversidge's leadership. As president of the Electrical Association of Philadelphia he has carried local co-operation to an effectiveness that has not been seen before in the electrical industry and has had a profound influence in the thinking of electrical men. As chairman of a committee appointed some time ago to find the answer to the problem of what to do with the Society for Electrical Development, initiative in this direction would rightfully come from him. As an active power company executive, who has won national prestige among all four branches of the industry for his ability and understanding in co-operative market development, he stands in a favorable position to carry such a project through.

Times have changed and most men recognize today that the electrical market must be built largely by local teamwork. But to prosper this co-operation in the cities there must be harmony in the national policies of the dealers, contractors, wholesalers, manufacturers and power companies, and it will not come of itself. It means that there must be a forum where the thinking of the national associations of these groups may be co-ordinated. There must be a basis for conducting those co-operative sales activities in which they join.

The politics of the Association situation have changed with the dissolution of the N.E.L.A. A council of the industry is needed, and it should be something new to fit the new conditions. And such a council might well spring from an industry convention, such as was suggested in these columns last week. It would be a joint meeting of the four branches of the industry, held for a frank discussion of common problems.

The interregnum in committee work

LAST week in Chicago the N.E.L.A. National Sales Section held its final meeting of committees, to report on work in process and to discuss the dissolution of the association and what it portends. And in the absence of a definite knowledge of the plans that are to be followed in organizing and operating the committee work of the new Edison Electrical Institute, there were more questions than answers. So the fate of many plans hangs in the balance and the late committee chairmen are eager to learn what is to be done.

There are two objectives in all this work. One is the development of the art. The other is the development of men. Both have played an important part in the program of the electrical industry through past years. Both will naturally continue as vital influences in the years ahead. For the conflict of ideas and the co-ordination of action that comes out of it are stimulating and constructive.

It is unfortunate that the committee program for the E.E.I. could not have been crystallized early enough to avoid this uncertainty, that naturally discourages so many men who have been eagerly at work for the advancement of the industry and suddenly find themselves suspended in the air. For it does more than delay desirable activities. It dampens enthusiasm. It seems of vital importance, therefore, that the operating committee, now in charge of the organization of the E.E.I., make haste to announce its committee structure, before the backward drift begins. The set-up of the committees and their functions should be promptly defined. And the committees, in turn, should also announce their plans and personnel. Otherwise a stagnation may set in that will affect not only national work, but sectional activities, and stay the progress of allied projects affecting other branches of the industry.

The creative value of many of the committee plans reported last week justifies the continuance of the effort even in a curtailed program. But time is of the essence of this contact. The spirit of co-operation that has been kindled through the years is worth protecting. There is a tradition bound up in this committee work that should be saved, for its educational value to the young men of the industry.

Co-operative Marketing on a National Scale

A call to action recommending an organization co-ordination between the four national associations of the electrical industry for the purpose of market development.

By H. P. LIVERSIDGE*
Vice-President Philadelphia Electric Company

IT HAS been my desire for some time to outline before a representative industry group certain thoughts with regard to the broader application of co-operative methods in the promotion of electrical industry sales. There never has been a time in the history of our industry when conditions were more propitious for definite constructive action than the present. And, we might add, never a time when there was greater need for improvement in sales volume. Due to the recent formation of the Edison Electric Institute, a trade association comprising only electric utility interests, we now have a most favorable opportunity for the establishment of an all-industry sales promotional bureau for the effective correlation of marketing activities through a national, sectional and local combination. It is the urgent need for such a plan to which I wish briefly to direct your attention.

As we look back over the record of the past decade, it becomes quite apparent why the principles of co-operative marketing were not more generally applied. During this "gold-rush" era mass production held the center of the stage, while distribution was relegated to a minor part in the show. With a hundred million people scrambling for a place in a buyers' line, why the need for concern? Then, almost over night, that great army of consumers disappeared, and business now faces the Herculean task of combing the highways and byways in search of the buyer, who is the all-important factor in our realm of trade. That's the job ahead of us, and if I'm not mistaken, it will continue to be the job for a long, long time to come.

Basically, these newer methods will be built around the principle of co-operative marketing, and just as in the past we devoted our best thought, time and effort to the development of a great production machine, so for the future our best endeavors must be directed toward the building of a sound economic distribution machine. In my opinion no other industry is in so unique a position to develop such plans quickly and effectively as the electrical industry. Already we have a background of experience in intelligently directed local association work that has proved the advantages which can be obtained. Yet, notwithstanding the successful records of a number of comparatively unrelated local associations during the past twenty years, there is a relatively small coverage of our national market.

We may properly ask the question, therefore: If a few localized groups are effectively administering their sales programs on a co-operative basis, why has this principle not been more generally applied? On this point one opinion is probably just as good as another. Yet, broadly speaking, the real reason most likely is that neither from a national standpoint, nor a local one in many instances, have we been in a position to cope effectively with the obstacles of exaggerated individualism and misunderstanding. It is also possible that those who might have aided very materially in the broader application of co-operative marketing were so engrossed in the national phases of their individual problems that they failed to appreciate the basic importance of local associations. It would seem to me that we have been too prone to think of national sales in abstract and general terms. As a matter of fact, our national sales problem is merely the integration of a million and one local sales problems. The address of the individual customer in this nation is not Mr. and Mrs. John Q. Public, U.S.A. This individual, to whom we must direct our sales effort, has a most specific and definite address, and it is on that localized address that we must concentrate our attention.

These are the things that have blocked our progress toward the widespread application of co-operative marketing in the past. However, they are behind us, and the road ahead seems cleared of those major difficulties that could retard the rapid development of co-operative plans.

The point to which I am leading is the fact that if we are to secure the future volume of sales we so sorely need, then what is being done in New York, Philadelphia, Chicago, Cleveland, St. Louis and other centers of population today should be duplicated in every part of this country where electric service is available. In order that this may be done quickly and effectively, some specific organization for national, as well as sectional, co-ordination must be created. It is this important phase of the

**An address before the Electrical Association of New York, Inc. March 15, 1933.*

problem which demands our immediate attention. When this is accomplished there will be little difficulty in completing an economic machine, created for the specific purpose of increasing sales and reducing the total costs of distribution—a national organization which would function from the manufacturer down and from the retailer up.

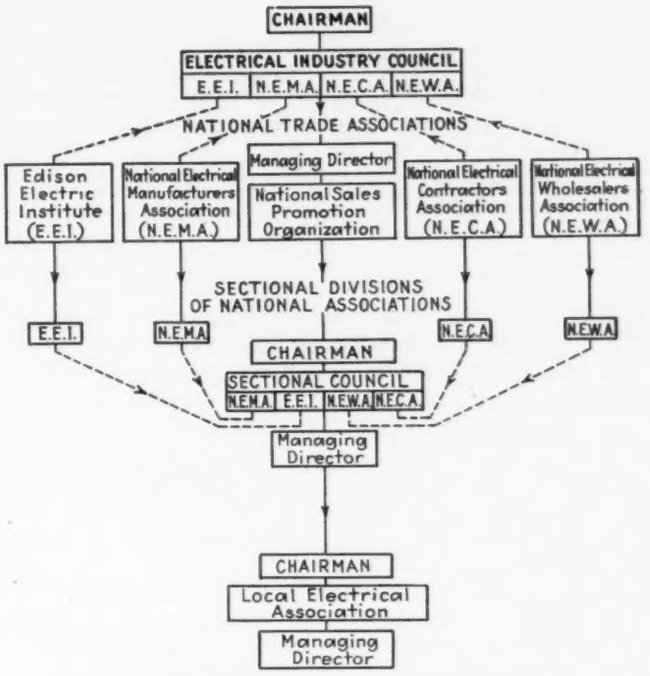
Of necessity, a comprehensive national plan of this character must be developed with the greatest care. We must insure definitely against the uncertainties of costly experiments. It is my belief, however, that the electrical industry has one of the greatest opportunities of its existence to lead the way to more efficient methods of selling through the medium of co-operative marketing. The stage is set for what might readily prove to be one of the most spectacular performances that the industrial world has ever seen—greater, in my humble opinion, than the outstanding record in mass production. We know with a certainty that collective action directed toward market development, timing of sales programs, checking and elevating standards of business ethics, with general agreement on and adherence to equitable trade policies, all are fundamental in the development of increased distribution of commodities at reasonable prices to the consumer and at costs which permit a fair margin of profit to all.

If to these we can add inspirational and forceful leadership, and intelligent understanding of each other's problems through the exercise of frankness and fair dealing, the main difficulties in the path of co-operative action are removed. The way is then cleared for the performance of the individual who has it in his power to determine what share of the business he will secure for himself. With these fundamentals before us, with the need for greatly increased volume of business in every branch of our industry more apparent now than ever before, with the necessity of doing this job quickly and economically, what should deter us from taking those initial steps that appear most obvious now?

Surely it does seem pertinent to ask each other why don't we do something about it? Where can one find an individual in business today who is not struggling with the discouragements of the defensive battle we are waging? Who is not engrossed in the problem of shaping his daily performance to meet the persistent issues of a declining market, grasping at expedients, living in an atmosphere of day-to-day existence? Who does not recognize the need for unity of thought and action, and who will not welcome with open arms any measures that will assist him or his company in securing a greater volume of sales in a more economic manner?

Those of us who have had experience in local co-operative efforts during these trying times recognize the great bulwark to morale alone which has been afforded by this work. Surely there is nothing theoretical about this, and it would certainly seem that we need only a little initiative and courage to start such a program. It may be that the difficulty lies in the fact that each interest is waiting for the other. In the last analysis, it cannot be regarded as the problem of the National Electrical Manufacturers' Association alone, nor is it the problem of the National Electrical Wholesalers' Association, the National Electrical Contractors' Association, nor the Edison Electric Institute. It is a problem in the solution of which each unit must join on a mutual-interest basis.

Our problem resolves itself, therefore, into a few logical, orderly steps of procedure:



A suggested plan by H. P. Liversidge

for the co-ordination of trade associations within the electrical industry and the formation of a sales promotion organization which would guide policies from the national body, through the sectional division organizations to the local associations.

First—The formation of a national co-ordinating council in which our four national trade bodies will be equally represented.

Second—The creation of a national bureau for the specific purpose of promoting and co-ordinating national, sectional and local sales programs.

Third—The creation, where necessary, of such sectional or state associations as a tie between the national body and the local groups.

Picture, if you please, the possibilities inherent in such an organization! It is intriguing, indeed, when we realize what can be accomplished through a unification of all interests, what reductions in costs of distribution can be made, and what increased sales are possible through the orderly and intelligent administration of such a plan! The manufacturer certainly needs this help; likewise the wholesaler, the local contractor and dealer, and surely the local power company—every branch of the industry needs this impetus to start once more on the road to far greater prosperity than we have known in the past. Certainly now is not the time to quibble over details. This is the time for action. Too many of us have been waiting for the turn of business. Let me suggest that we have already made that turn, but the business we are looking for is ours only if we plan to get it.

If the award for co-operation recently tendered me is not the signal for my graceful retirement from the scene, I certainly will keep going toward the ultimate accomplishment of these objectives. Surely no harm can be done in making the attempt to obtain from those who are guiding the destinies of our four national trade associations their support in the furtherance of this important cause. That I propose to do. And I am optimistic enough to believe the answer will be, "Yes; when shall we begin?"

Servicing Schedule Keeps Motors Operative

By W. A. E. McLEISH

Electrical Engineer Belgo Division,
Canada Power & Paper Corporation, Shawinigan Falls, Que.

TO INSURE uninterrupted 24-hour service in an industrial plant operating 508 motors with a total rating of 49,000 hp. regular and thorough inspection is essential. A simple system of records scheduling this work is of great help. In this plant we have used such a system for the past five years and the proof of its value is evident in the fact that during this period the amount of lost time due to electrical troubles has been practically zero. The motor ratings range from 1/6 to 2,800 hp.

As each motor enters the plant a serial number is affixed to it. This number is recorded on a 6x4⅜-in. (Fig. 1) folder with complete data from the nameplate, with bearing sizes, winding information and pattern numbers if any. Size and grade of brushes for slip-ring or direct-current motors are shown. These folders are conveniently filed in a standard 4 11/16 x6⅛-in. drawer for reference in making replacements or repairs and holding all information on the particular motor.

Each individual or group drive is then given a separate location or department number which is entered on a 4x6-in. "Motor Service Record" card (Fig. 2) with information covering the name of drive, motor number, horsepower, date of installation, etc.

System of location numbers

For accounting purposes, each department is given a number, 1, 2, 3, etc. In 1926, two additional machines were installed in this plant, and, as it was found necessary to practically double our substation, and new switchboards were required, the writer took the opportunity of putting in the various feeders, so that each department would be kept separate. By so doing it was possible to obtain an accurate account of the power consumption in each department at the same time. This scheme worked to advantage in numbering the various drives.

The various feeders for each department are numbered to correspond to the particular department, as follows: 1A, 1B, 2A, 2B, 3A, etc., are the numbers of the feeders supplying power to departments Nos. 1, 2, 3, etc., respectively.

All motor drives in each department are so numbered that the first figure represents the department number. Each number ends with a letter, so that the first figure and the letter identify the feeder to which the motor is connected. Thus, location 416E shows that motor drive No. 16 is located in department No. 4 and is connected to feeder 4E. As it is easy for the maintenance men to remember the various department numbers and the feeder locations no time is lost in locating the drive. In one department there are more than 200 motors, and in this case the drives are numbered from 400 to 499, 4,100 to 4,199, 4200, etc. The location number is always referred to in making reports.

Motor tenders or inspectors examine all motors and control equipment at least once on each shift. This inspection simply covers the normal running condition of the motors, etc. In addition, they are responsible for lamp maintenance and make minor repairs to electrical equipment as required. Any troubles that occur and any lamps or fuses renewed during a shift are reported on a "Motor Tenders Report" sheet (Fig. 3). These sheets are 8½x11-in. in size. Major troubles are immediately reported to the maintenance department.

All motors and control equipment are given a thorough inspection at least yearly, and in some cases, quarterly, depending on the drive and its location.

As our maintenance work has to be done on week-ends, when the mill is shut down, we have scheduled the motors to be inspected each week-end. Owing to the large number of motors involved it was found necessary to divide this work into four groups, two of which are taken care of by operators, one by the motor tenders or inspectors and one by the shop or maintenance staff. Fig. 4 shows portions of one of these schedules, and it will be observed that motors on locations 328, 329, 330, etc., are scheduled for inspection on the 8th, 21st, 33d and 46th week-ends, while those on locations 411, 412, 413, etc., are scheduled for the 2d and 27th week-ends only. As the cranes are usually in use on the week-ends for changing felts, etc., they are inspected during the week, the crane motors twice and the crane controllers four times per year.

At these week-end inspections the air gap is carefully checked on all positions so as to detect any evidence of bearing wear. As an additional precaution the bearings are examined for signs of wear. Particular attention is paid to ball and roller bearing motors, of which there are 163, to ascertain if the ball and roller cages show signs of wear. The condition of the grease is noted and changed, if it shows any tendency to disintegrate, or more grease is added if found necessary and if the present grease is found to be all right. If the winding is dirty or oily a record is made so as to have the motor opened at the first opportunity. In examining the controller or starter any burnt or blistered contacts are filed or renewed. The setting of the overload relay and oil level in dashpots is checked and adjustments made if necessary. Brushes are inspected for wear and seating and the spring tension is checked. On d.c. motors special attention is given to the commutator. Wire edges are filed off and the condition of the undercutting noted.

The motor serial and location numbers are taken in conducting inspection and maintenance to check the "Motor Service Record" cards, as there have been isolated cases where a motor has been taken out of service without notifying the electrical department to that effect.

All of the information pertaining to the condition of a motor and its control equipment is filled in on the "Motor Inspection Report." These sheets (see Fig. 5) are 4⅛x5½-in. in size and are made up in pads of 50. Any motor that is reported as defective is noted on the

week-end repair and inspection list. This list is typed on standard letter-size paper and a new list is made out each week-end. Six copies of this are made and copies are given to each of the maintenance crew with the name opposite the work to be done by each individual.

When repairs are made they are entered on a sheet of the "Motor Inspection Report." These reports are filed in the "Motor Record" folders, so that all information pertaining to a particular motor is available in one place. Apart from checking the motor serial number against the location number on the "Motor Service Record" card and filing the "Motor Inspection Reports" there is no clerical work involved in keeping this system up to date.

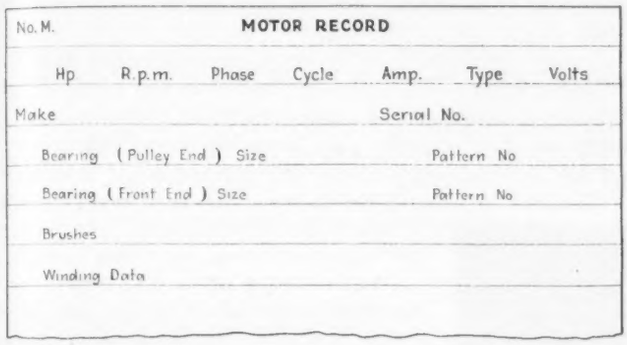


Fig. 1—Motor record folder carries this information for quick reference

A 6x4¼-in. folder for each motor serves as repository for inspection reports (Fig. 5).

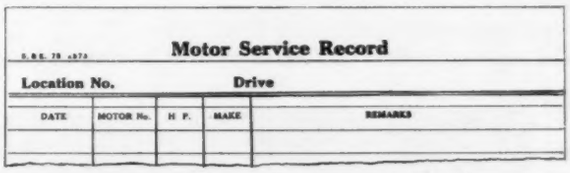


Fig. 2—Motor service record card

A 4x6-in. card filed by location

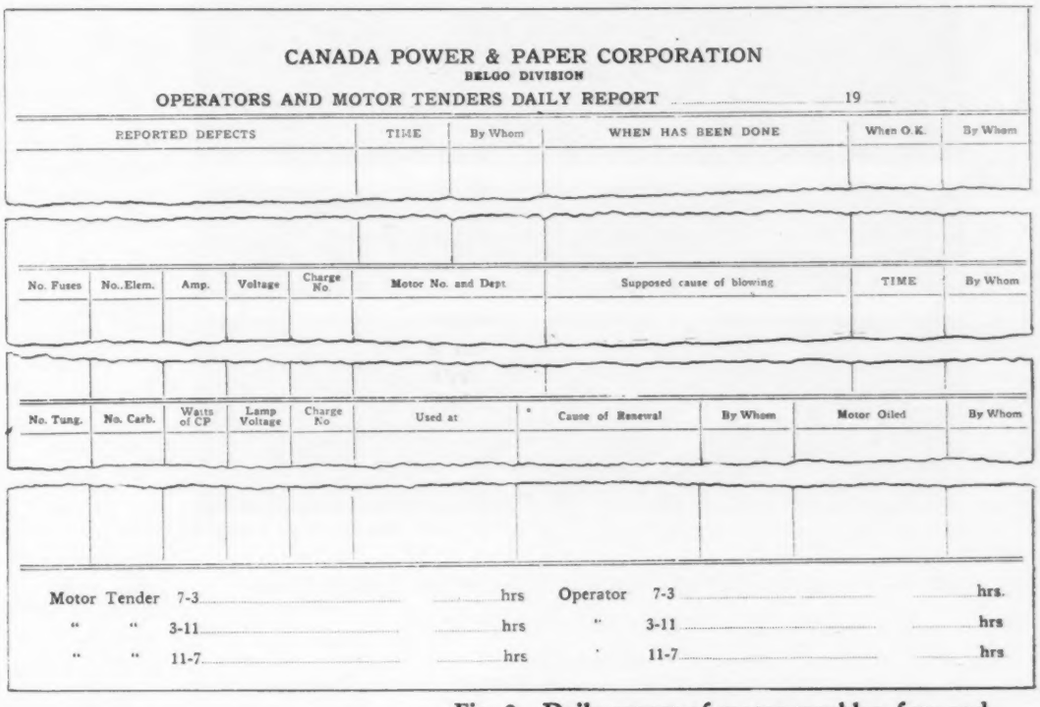
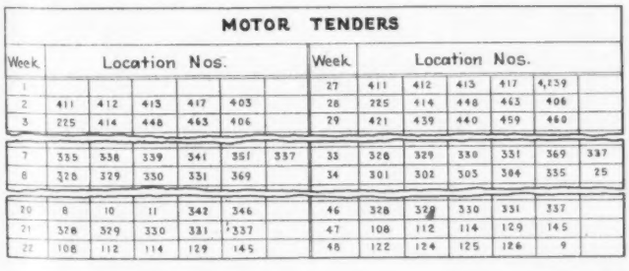


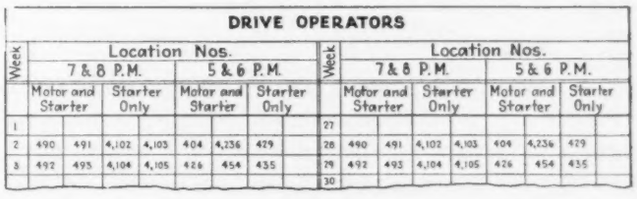
Fig. 3—Daily report of motor troubles, fuse and lamp replacements

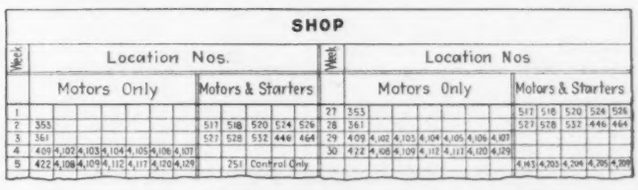
An 8½x11-in. sheet for motor tenders

Fig. 4—Method of scheduling motors for week-end inspections

Divided among operators, motor tenders or inspectors and shop or maintenance staff. The actual schedule covers 52 weeks and all motors.







Figs. 6 and 7—Drive operators and shop periodic inspection schedule

Just a portion of each schedule is shown. Actually there are schedules for each week.

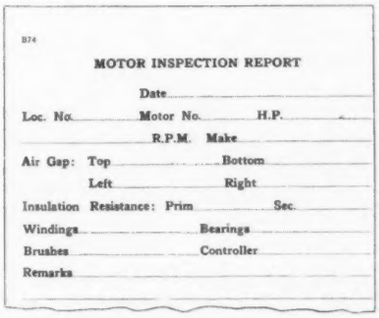


Fig. 5—Motor inspection report

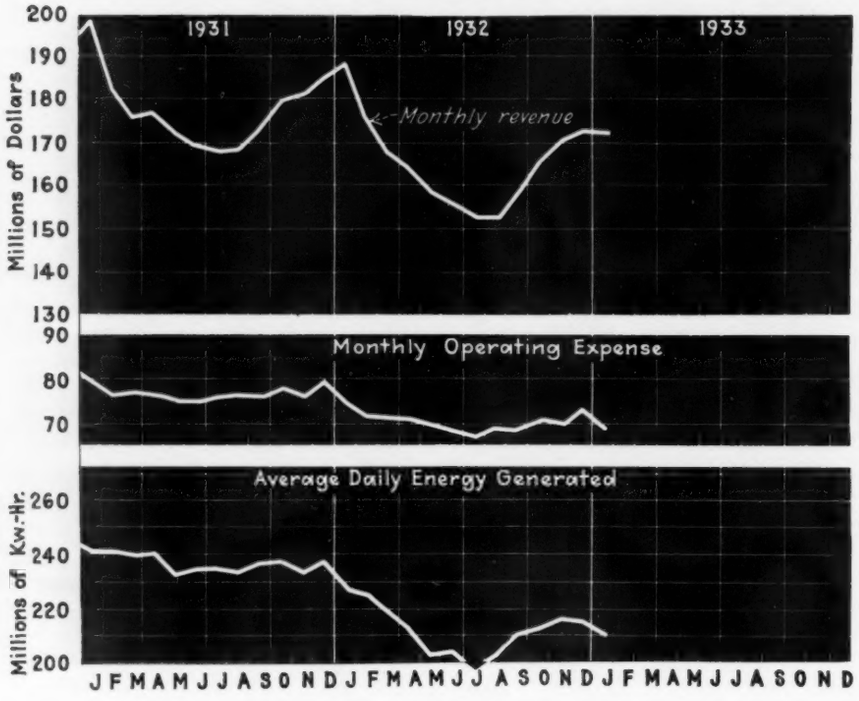
A 4½x5½-in. slip made out for each motor and eventually filed in motor record folder (Fig. 1).

Electric Light and Power Earnings Trail Last Year's

Revenue of electric light and power companies in January averaged 8.8 per cent less this year than last, the estimated total for the industry being $171,370,000 (including intercompany sales), according to returns received by ELECTRICAL WORLD. This is slightly less than the corresponding amount for December.

The returns reflect the effect of the decreased energy output in December, which was down 9.4 per cent from that of the preceding year, so that a sag in revenue was to be expected. The drop was in a large measure compensated by an almost proportionate reduction in operating and maintenance expenses, these amounting to $67,760,000, as against $73,940,000 in the first month of 1932.

Energy production in January, approximately 6,512,000,000 kw.-hr., was 8 per cent less than last year. This indicates a small relative improvement over December and holds out the possibility that a similar improvement may appear in February revenue when returns are available for that month. Recent weekly production figures foreshadowed little change in relative revenue for some months.


1931
1932
1933
Millions of Dollars
Monthly revenue
Monthly Operating Expense
Average Daily Energy Generated
Millions of Kw.-Hr.
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D

Water power again contributed an unusually large share of the total output; the 2,796,000,000 kw.-hr. from this source was 43 per cent of the whole. The fractions in November and December were, respectively, 41 and 39 per cent. A few months ago the favorable effects of greater streamflow, after several very dry years, were still in evidence. Much less energy had to be produced from fuel, the decrease from the preceding year at times approaching 25 per cent. That has ended. Fuel-generated energy in January of this year was only 10.5 per cent less than last year.

Revenue in all sections of the country has been consistently smaller than in corresponding months of recent years. This condition continues. The deficiency was somewhat greater in January than in December in the predominantly industrial regions composing the northeastern part, as well as in the South Atlantic region. In four of the nine the decrease in revenue from January, 1932, exceeded 10 per cent.

Energy output in the South Central and Mountain States decreased more, compared with 1932, than in other parts of the country, the decline ranging from 14 to 16 per cent. Much of the decrease was in the part produced from fuel.

Table I—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1932	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
October	6,589,989	— 9.5	2,499,484	+27.2	4,090,505	—24.1	2,044,000	+ 7.2
November	6,504,370	— 6.8	2,674,830	+37.2	3,829,540	—23.8	1,885,000	+ 3.5
December	6,655,756	— 9.4	2,570,550	— 0.3	4,085,206	—15.0	1,982,000	+ 7.0
1933								
January	6,511,933	— 8.0	2,795,835	— 4.8	3,716,098	—10.5	1,820,000	— 3.0

Table II—Regional Revenue, Energy Output, in January, 1933

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated, Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	171,370	— 8.8	6,511,933	— 8.0	2,795,835	— 4.8	3,716,098	—10.5
New England	18,751	— 7.0	445,135	— 8.8	253,581	—11.7	191,554	— 4.7
Middle Atlantic	47,180	— 8.6	1,695,512	— 4.5	554,299	+ 0.4	1,141,213	— 6.8
East North Central	39,868	—10.2	1,481,606	—12.3	161,546	—28.5	1,320,060	— 9.7
West North Central	14,137	— 9.3	478,805	— 4.0	160,299	— 4.7	318,506	— 3.7
South Atlantic	18,111	— 7.7	837,926	— 4.8	553,687	— 2.4	284,239	— 9.4
East South Central	5,467	—10.4	254,485	—16.2	208,193	—13.3	46,292	—27.7
West South Central	8,909	—11.5	284,806	—14.5	7,539	—71.5	277,267	— 9.5
Mountain	3,980	—10.5	184,975	—16.2	134,789	— 8.5	50,186	—31.5
Pacific	14,967	— 7.4	848,683	— 5.3	761,902	+ 6.5	86,781	—50.8

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central-station operations.

Table III—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

Month	Total Gross Revenue from Sale of Energy*		Total Operating and Maintenance Expense†	
	1932 Thousands	Per Cent Inc.	1932 Thousands	Per Cent Inc.
Oct.	$165,410	— 7.4	$70,060	— 9.1
Nov.	169,730	— 6.9	69,390	— 7.8
Dec.	171,880	— 7.5	72,350	— 8.8
	1933		1933	
Jan.	171,370	— 8.8	67,760	— 8.4

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.

†Does not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions.

Economics of Line Extensions

General method of approach based upon actuarial data.
Fallacies of use of individual cases or arithmetical averages.
Over-all return and life-determining elements.

By ROBERT TOPHAM OLDFIELD

Senior Electrical Engineer
New York State Public Service Commission

ECONOMIC conditions during the past few years have made the problem of the investment of capital in the electric light and power industry of increasing difficulty. This has been due, in part, to the unfavorable financial situation, which has made it uneconomical to market securities. It is true, of course, that securities could be sold, but because of the expense involved this has been curtailed to the minimum. Aside from this there also was an unfortunate psychological situation, which made utility executives very hesitant to try to raise funds at this time. Consequently this scarcity of capital for the extension of facilities has emphasized the necessity for an understanding of some method of procedure in the analysis of the problem of line extensions.

Since many individual extensions may be economically unprofitable to the utilities, it is often necessary for the prospective consumer to share the construction cost. This has added to the difficulties because the prospective consumer, under the present economic conditions, is often not in a position to contribute his share of these construction costs. Further complications are created by the fact that the prospective consumer often does not appreciate his own financial responsibility. He feels that the company, by virtue of the rights granted to it in its franchise, should furnish him with electric service without any obligation on his part. The existence of all of these circumstances has brought this problem prominently to the fore.

This problem, of course, has always existed to a greater or less extent, but economic conditions have not been such as to make it of major importance. Further complications have been added due to the recent rapid expansion of the industry, particularly that of interconnections. For example, when towns A and B each had their own isolated plant, operating independently, the question of line extensions was of relatively minor importance. However, when it was found economically expedient to connect these two plants the problem became of major importance, because every inhabitant in the immediate vicinity of this line became a potential consumer. Before this condition had developed this problem apparently had only been given indifferent consideration, for many line extension contracts had been drawn which proved to be economically unsatisfactory to either the company or the consumers. Perhaps more serious than this was the fact that these contracts sometimes established precedents that made it very embarrassing for the company to attempt to change its policies.

General methods of approach

It is not the intent of the author to present any panacea. It is appreciated that every company has its own unique economic conditions, and consequently each must be considered individually. However, it is believed that a general method of approach can be developed when the economic characteristics of the problem are understood. This will eliminate a great deal of the misunderstanding that exists at the present time by affording a common basis for discussion. If this can be done the numerical solution will readily follow. It is obvious that the practical solution of any business problem is largely a matter of compromise. The interests, for example, of the consumer, the company and the general public oftentimes conflict. To reconcile or adjust these is a matter of business judgment, which cannot be accomplished by a mathematical formula. Mathematical and economic theories, however, do furnish an efficient and clear way of depicting the situation. This, then, will furnish a basis to be used as the point of departure.

It is a truism that when a problem is understood it is half solved. In the problem under consideration experience in the analysis of a large number of line extensions has indicated that the fundamental characteristics have often been obscured by masses of data in the form of tabulations, ratios, unit costs, etc. In other words, it comes down to the old story of not being able to see the forest for the trees. For this reason a minimum of numerical data will be here included, only enough being introduced to demonstrate the method.

Classification of extension problem

There are many ways of classifying problems, which is the first step in analysis. For our purpose, however, this classification need only be made in two ways:

1. Attempt to analyze each case individually, or,
2. Attempt to analyze the problem as a mass phenomenon.

The conventional approach is to analyze each line extension individually on its own merits. To do this certain estimates are necessitated:

1. The life of the line.
2. The annual net revenue.
3. The life of the consumer.
4. The operating efficiency of the company during this period.

As a practical business problem an estimate of these factors that will yield a result sufficiently accurate so that both the consumer and the company will receive adequate economic consideration is quite impossible. The predominant and unique characteristic of this problem

is that we are dealing, not with one line extension, but with hundreds, or, probably, thousands annually. The procedure, therefore, is identically the same as that used by insurance companies. No insurance company would attempt to analyze each individual risk on its own merits, but the fact that insurance companies are profitable and stable concerns indicates that this method is probably correct. Line extensions, like human beings, contain so many variables which may not be appraised that it is impractical to try to consider them as isolated cases. Probably one of the most important reasons for the confusion existing in this problem is that the cases have been considered independently, the data from one line being used as a basis for computation on other lines. This implies that the extensions are identical, but there are no identical situations any more than there are identical human beings. Briefly, therefore, this method gives the wrong answer.

Operating executives realize that many line extensions will not yield a profitable return; they also realize that some will yield an abnormally high return. The important thing is that the over-all return on all the extensions be reasonable. The exigencies of modern business dictate that such a condition will exist in many of its ramifications. In other words, it is necessary as a practical operating problem to take the lean with the fat.

Averages lead to errors

Before introducing the specific mathematical technique it is desirable to mention and emphasize one of the principal fallacies of the method frequently used in the attempt to solve this problem. This is the obsession for using the arithmetic average. Perhaps this is due to the fact that it is one of the simplest mathematical parameters, but this does not in any way prove that it is the correct factor to use. The unweighted arithmetic average possesses valuable mathematical characteristics. However, it only has logical significance in certain very special cases; specifically, when the distribution of the cases are symmetrical; in other words, when the "mean," "mode" and "median" are identical. Experience in the analysis of problems of this kind furnishes abundant evidence that these characteristics form a distribution which is highly skewed. For example, it is well known that the "average" kilowatt-hours per customer, obtained by dividing the total kilowatt-hours sold by the total number of customers, is a fictitious and misleading figure. This is due to the fact mentioned above that the distribution of the individual cases of kilowatt-hours per customer is skewed. In some data of this kind recently analyzed the average kilowatt-hours per customer per month were found to be 30, while the mode or peak of the distribution was only a trifle over 14 kw.-hr. per customer.

The data in the example given below are from an actual operating company. If such data, which will be different for every company, can be obtained, obviously the solution will be quite accurate. If the acquisition of such data is not feasible, an approach can still be made by the use of the Tchebycheff inequality, in probability mathematics.

The general formula, which forms the foundation for the approach to the solution of this problem, is conventional and may be found in any standard work on accounting. The one here used has been simplified by amortizing the investment on the "straight line basis." Theoretically, this should be done by the "sinking fund method," but this additional complexity is not justified in view of the necessary inaccuracy of the fundamental data.

This merely states briefly the main characteristic of the problem, viz., how much money can be invested such that a reasonable net return will be realized, and an amount above this will be received to amortize the investment during the useful life of the physical equipment.

This is as follows: Let,

A = The amount to be invested.
N = The net revenue received from the customer.
T = The life of the extension in years.
R = The rate of return on the line in per cent.

$$\text{Then } A = \frac{N}{R + \frac{1}{T}}$$

An examination of this formula shows that there may result a large number of what we shall call "situations"; that is, extensions have different useful lives, and while they are in use the operating efficiency of the company probably will change. For example, if 2.5 times the gross revenue is used as the basis of estimate for the investment to be made in an extension, this will insure an 8 per cent return on the following situations:

Operating Ratio	Life in Years
55	10
63	15
67.5	20
70	25

This same condition exists, of course, for any other ratio; i.e., every ratio will cover a large number of situations. The solution to the problem is to find the ratio such that, when it is applied to a large number of cases, it will insure an over-all reasonable net return on the investment. It is common knowledge that all extensions do not have the identical useful life. For example, there are relatively few that will exist for either a very short or very long period of time. The following figures were obtained from an analysis of several thousand records of line extensions of an electric light and power company:

Life in Years	Per Cent of Lines
0- 5	18.8
5-10	39.1
10-15	29.7
15-20	11.9
20-25	0.5

Likewise, operating ratios which are necessary in order to estimate the net revenues are relatively few, extremely high or extremely low. These also form a distribution of some kind, and the records of this company over five years showed that the distribution of this factor was as follows:

Operating Ratio	Per Cent of Cases
40-45	10
45-50	58
50-55	30.8
55-60	1.2

The individual items of these two distributions when combined form a compound distribution of situations. This is given, in per cent, in Table I. That is, the most rational estimate that can be made from the above data is that 1.88 per cent of the extensions will have a life of from 0 to 5 years and will be in use while the operating ratio is from 40 to 45 per cent; 6.9 per cent of the extensions will have a life of from fifteen to twenty

Table I—Distribution of Situations

Operating Ratio	Life of Extension, Years 0–5	5–10	10–15	15–20	20–25	Total
40–45	1.880	3.910	2.970	1.190	0.050	10.0
45–50	10.904	22.678	17.226	6.902	0.290	58.0
50–55	5.790	12.043	9.148	3.665	0.154	30.8
55–60	0.226	0.469	0.356	0.143	0.006	1.2
Total	18.8	39.1	29.7	11.9	0.5	100.00

Table II—Factors × Annual Gross to Insure 8 per Cent Return

Operating Ratio	Life of Extension, Years 0–5	5–10	10–15	15–20	20–25
40–45	1.20	2.74	3.59	4.20	4.64
45–50	1.09	2.50	3.28	3.83	4.23
50–55	0.99	2.26	2.97	3.47	3.83
55–60	0.885	2.02	2.66	3.10	3.43

Table III—Ratios Grouped as to Sizes

Table II Factor	Table I Frequency	Cumulative	Table II Factor	Table I Frequency	Cumulative
0.885	0.226	100.000	3.28	17.226	32.453
0.990	5.790	99.774	3.43	0.006	15.227
1.090	10.904	93.984	3.47	3.665	15.221
1.20	1.880	83.080	3.59	2.970	11.556
2.02	0.469	81.200	3.83	7.056	8.586
2.26	12.043	80.731	4.20	1.190	1.530
2.50	22.678	68.688	4.23	0.290	0.340
2.66	0.356	46.010	4.64	0.050	0.050
2.74	3.910	45.654			
2.97	9.148	41.744	Mean 2.58	100.00	Mid-point of series 50.00
3.10	0.143	32.596			

years and will be in use while the operating ratio is from 45 to 50 per cent, etc.

Ratio of investment to gross

The next step is to compute from the formula the ratio of the investment to the gross revenue for all of the above combinations. These are given in Table II. That is, if a ratio of 2.5 times the annual gross revenue is used it will not only insure an 8 per cent return if the line has a life of from five to ten years and the operating ratio is from 45 to 50, but it will also insure a return greater than this in every situation where this ratio is lower. The practical application of this method, therefore, is to discover the ratio which, when applied to a large number of cases, will yield an over-all reasonable return. In order to do this the ratios must be regrouped according to size, as shown in Table III.

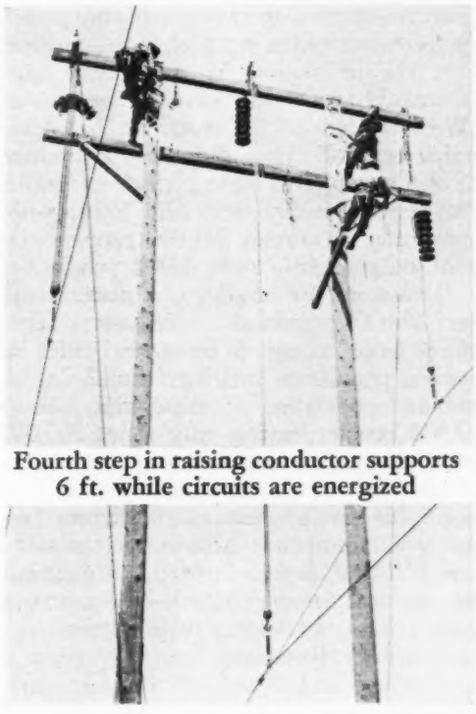
The ratio required is the one which, when applied to each of these individually, will yield an over-all reasonable return. This is the *weighted* arithmetic mean, which for the existing data is 2.58, which was arrived at by linear interpolation.

Use of results

From results of this kind a line extension contract may be drawn, the numerical values used depending, of course, on the unique distributions of the controlling factors that will be equitable to both the consumer and company. In conclusion, the author wishes to re-emphasize the fact that the figures here used are only for the purpose of illustrating the method and are not to be taken literally. Further, it is not believed that this is the only method of approach. It is merely a method which takes into consideration the unique characteristics of the problem and results in a practical solution.

Energized 110-Kv. Circuit Raised 6 Ft.

While the California Oregon Power Company's 110-kv. tie line with the Pacific Gas & Electric Company conformed to regulations of the California Railroad Commission, it was found that the ground clearance did not guarantee safety when hay derricks passed under the line. An additional clearance of 6 ft. was provided while the line was energized by extending the tops and attaching the conductors to higher crossarms. Although the work had to be done under difficult conditions, forty wood-pole supports were so changed without an accident of any kind. Hot-line tools were carefully handled to avoid scarring the wood and accumulating dirt thereon. A crew of twelve men, working an average of four hours per tower, made the changeover.



Fourth step in raising conductor supports 6 ft. while circuits are energized

The major steps in the conversion follow:

1. Installing gin poles and gaining and boring tops of the poles preparatory to installing structural steel extension tops.
2. Steel tops were raised and guided between the line conductors by specially treated rope tackle. In being carried to the final position, the steel accumulated an appreciable static charge. Although this could have been grounded out, it was felt that the ground wire presented a greater hazard than handling the tops with linemen who had knowledge of the static conditions.
3. The center conductor was dropped about 20 ft. with special tackle, wood-shelled blocks and treated-wood insulating sticks. Then the new crossarm was hoisted and fastened into position at the top of the extensions.
4. With the new crossarm in place, conductors were suspended from the latter by insulating tackle and the insulator strings were transferred to the new arm. This type of work was done only when there was little or no wind as no provisions could be made to side-guy conductors safely.
5. Because of the scant clearance between the old and new arms, the lower arm had to be taken down before clamping conductors in the new position.

Our Rental-Purchase Plan

By GEORGE S. WILLIAMS

Vice-President and General Manager
Central Maine Power Company, Augusta, Me.

Based upon customer use to create sales.

Full co-operation with other outlets.

Details of plan and results obtained.

Conclusions favorable.

IN RESPONSE to widespread interest in the rental plan of electrical appliances, we are glad to pass along some of the highlights we have encountered in the first ten months of our experience in the rental of electric water heaters.

First, there are certain facts which should be borne in mind concerning the operation of our plan and the territory we serve which we feel have more or less influence in the promotion of this policy on a large scale. Ostensibly, our plan has not been a rental plan only. We have labeled it "rental purchase plan," with considerable emphasis upon the word "purchase."

Then, one must get a true picture of our territory. We serve more than 300 cities and towns with a combined population of around 325,000 people. That is an average of only slightly over 1,000 people to a community. Lewiston, the largest, is a manufacturing city of under 35,000 population. We serve eight other communities large enough to be termed cities in Maine, which have a population ranging from 2,600 to 17,000. The combined population of these nine cities is more than 117,000 people, leaving only about 200,000 people in the remaining 291 communities. The buying nature, living habits and trade relations problems of communities of this size are naturally different from those of the metropolitan areas. Add to this the fact that the percentage of home owners in Maine is unusually large. It is estimated that between 65 and 75 per cent of Maine people own or are purchasing their homes.

In our territory there are less than sixty so-called contractor-dealers, and these, for the most part, are of the journeyman type, with no regularly conducted office or display room for the sale of electrical appliances. Most of them are one-man propositions and they bank on us more heavily to push these appliances than, perhaps, in the metropolitan areas, where outside contractors and dealers sell the greater percentage of electrical appliances. Only about twenty dealers conduct retail electrical stores, and these, for the most part, are but side-line propositions. Thus, more than 80 per cent of the electrical sales in our territory are done by our own organization, and any plan which we can use that will put more electrical appliances on the line and make more wiring jobs and outlet jobs for our contractors is looked upon with general favor.

Psychology of the purchaser

Another very important condition is the buying power of Maine people. In periods of extreme prosperity Maine seldom reaches the heights of other sections and, by the same token, in periods of depression seldom drops to the low levels of other sections. While subject to distressed industrial conditions generally, many Maine factories and mills kept going on a fairly level basis with not the acute unemployment situation of other sections of the country. From a study of bank deposits and general conditions, Maine buyers, we believe, were in a better position to purchase their actual needs than most other sections of the country. We found buyers had the money to spend if they could be convinced, but it was harder to convince them because the countrywide psychology of the times was to "hold on to your money."

By pursuing two definite plans of operation we felt we could unloosen these pursestrings and stimulate sales. One was the regular plan of newspaper advertising, showing the benefits, advantages and, in many cases, economy of electrical appliances. The second plan, and closely allied with the first, was to get the appliance into the home where it could be used.

Any electrical dealer fully appreciates the value of getting an appliance into the home, for once actually there, used and understood, it is a long way toward being sold.

Thus, we decided upon our rental purchase policy as the easiest and quickest way to get the appliance into the home, where it could be used over a period of time and where the purchaser did not feel the obligation to purchase unless he was entirely satisfied.

Type of heater used

It might be well here to describe briefly the type of water heater which we had adopted. As the result of several preliminary tests, we were firmly convinced that if we standardized on a 50-gal. boiler, properly insulated, with a split circuit unit of 500-1,000 watts, or a total of 1,500 watts, we would not be taking any very great chances of upsetting all of the company's policies with reference to peak-load demands or causing any enormous increase in capital investment. We would have something very simple to merchandise and we would be giving a certain satisfaction to our residential customers which would still further promote the use of electricity in the home.

A 50-gal. boiler seemed to be the type that could handle the average water-heating load throughout our territory. Occasionally it might be necessary to install a 3,000-watt unit, but the cases would be rare and we would treat them as special and put them on our regular demand rate.

We wanted to merchandise an appliance with only 1,500-watt capacity in order to cut down wiring costs for the customer, make it simple to install and cut down

the demand on our distribution transformers and secondaries. Thirty-gallon boilers would not take care of the average customer, without higher wattage; operated off-peak would require from 2,000 to 2,400 watts on a 50-gal. boiler, and it was a case, if operating off-peak, to go either to higher wattage or a larger tank. If we had considered the 100-gal. storage tank our salesmen would have had to include building estimates with their installation costs in order to have found a place to install them in the home.

A special water-heating rate was filed for heating water where the demand capacity is not less than 1,300 watts and only where the entire load consists of one or more low-wattage automatic storage water heaters, each of which has a connected load of not more than 2,000 watts. No customer having this service may connect any other appliance to the meter. The rate is 1½ cents per kilowatt-hour, with a minimum charge of $1 per kilowatt of connected load per month, and in no case less than $4 per month. (At the present time a new rate is being filed, reducing this minimum charge to $36 per year.) This provided a rate for one who wished to operate a low-wattage electric water heater on a separate meter and obtain the 1½-cent rate.

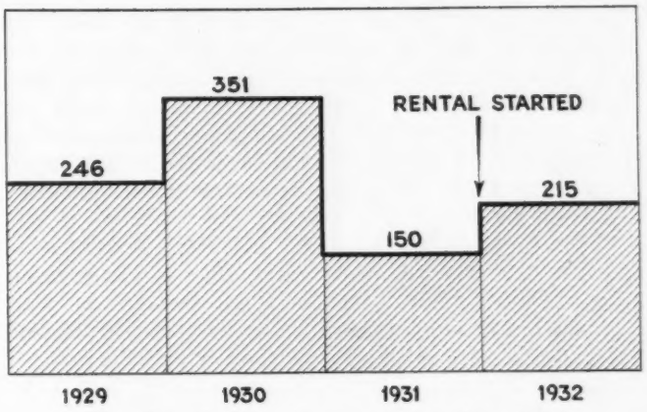
To learn just how thoroughly this rental-purchase plan arrested the downward curve of appliance sales which we were beginning to experience for the first time it is necessary to go back briefly to note the trend of hot water heater sales prior to the adoption of this policy. In 1929 and 1930 we sold around 600 storage type hot water heaters, the larger percentage of the sales coming in the latter part of 1929 and early in 1930. Then sales began to fall off and only a little more than 100 were sold in 1931. In the first 4½ months of 1932 sales were only 24 and falling rapidly.

On May 9, 1932, we started the rental-purchase plan of these heaters whereby a customer might rent one for a minimum of one year at a monthly rental of $2 plus energy charges. In reality, the plan allowed a period of seven years for payment, for if a customer kept his heater that long it became his property if he so wished.

Where we had found that people in the past had taken exception to the idea of "installment" buying, they were quite open to the "rental" plan, which was a little different approach that appealed to them in trend with the times. They felt that after a period, if they couldn't afford it, the obligation to buy was not there and they felt easier about having the heater installed. In less than two months we "rented" 154 heaters. This was eight more than were sold the entire year previous to the old plan.

If we had continued then, with all the enthusiasm worked up, we would have increased this figure materially, but it was felt best to take time out and feel our way along a bit. We found, however, that people were very well satisfied. No rentals were coming back and the plan seemed to be highly successful. Of course, we did not rent these heaters promiscuously. If we really felt a customer couldn't afford it, we discouraged the rental. Mindful of the fact that we operate in small communities, where people know each other's affairs to a more or less degree, it is pretty easy to watch these rentals. Only cases were pushed where we felt eventually a sale would result.

We can see where much harm could result from a promiscuous rental plan of a major appliance where installations could not be checked and where the return of equipment might lead to a disastrous second-hand market.



Results of water heater sales and rentals

Later in the year we tried the idea again for a short time and added 35 more—admittedly the worst time of year to sell electric water heaters in Maine, when people plan to connect their hot water supply to their regular house heater system. We doubtless would not have sold more than 50 heaters during the entire year on the old plan, thus we felt we had about 135 extra heaters with an estimated load of more than 500,000 kw.-hr. at our average rate of somewhere between 1½ and 2 cents a kilowatt-hour. This would amount to nearly $10,000 for the twelve-month period and the investment was taking care of itself over the seven-year period.

Results of rental plan

Our rental plan has been in effect nearly ten months and to date only about six heaters have been returned. One was because of moving away from our territory and the others were mostly due to higher cost of operation than was at first estimated, due to the fact that the customer used considerably more hot water than formerly, resulting from the convenience of this new service.

This increased use of hot water was true in many cases—people who had this service used more hot water than formerly, but once accustomed to its convenience were willing to pay a trifle more for the added advantages.

Which gets back to the theory that *the best way to sell an electric appliance is to get the customer actually to use it in his own home.*

Questions and answers

Answering a question often asked us, "Is this an idea to develop very fully," we are not ready to say. There are local conditions which must be taken into consideration, we feel, but generally speaking, if you mean water heaters and watch your installations, then we say, yes.

Another question that is asked is, "How do you purchase on a basis that dealers can purchase on the same basis?" Taking into consideration our type of dealers and contractors, as mentioned previously in this article, we find that the majority of these people much prefer us to do all the promotional and advertising work and to allow them a straight commission on all installa-

tions they make. Most of them haven't the money or inclination to load up on larger appliances, and for the most part, they are looking for the extra wiring and contract jobs the sale of electrical appliances make for them. Plumbers not only get the same commission for all rental sales made, but also the extra installation work. Thus many leads and actual sales are secured through this co-operation.

"Who cares for the financing and what should it cost and can dealers participate?" is another question often asked. On all rentals and sales made through our own organization and for sales made by co-operating dealers and contractors of our own appliances we take care of financing. On any other appliance sold or rented by an independent dealer or contractor we do not attempt to finance it in any way.

"How do you co-operate with the dealers in renting?" This has already been partly answered in the foregoing paragraphs. We announce our plans to all local dealers and contractors, either through a special bulletin, which is published from time to time, or through letters and personal contact, telling them what commission is available to them and asking them if they would like to have us place their names on our advertising as co-operating in the plan.

In any unusual case of selling or rental we take this up with our contractors and dealers, endeavoring to get their reaction, and if found practical for them, to get their co-operation. In order to do this we realize there must be advantages of the plan accruing to the dealer and contractor.

"Who will service the rented appliance and who will stand the cost of major repairs?" This is borne entirely by our own organization. To make sure of positive service we plan not to lose the identity of the sale or rental, even though made by a dealer or contractor. The customer looks to us for this service, as noted on the rental-purchase contract, which states: "We are to pay all expenses of installation and removal and at the customer's request to furnish without cost to him all material and labor that may be necessary to remedy any electrical, mechanical or thermostatic control defects which may develop from the time of installation until purchased by the customer."

"How will reverts and second-hand markets be handled?" If this plan works out as we have set it up we will not have many. Bear in mind that the idea back of every rental is a purchase and customers are selected on that assumption.

Renters and owners treated alike

While we make no distinction between soliciting home owners and home renters, we find that this particular point does not seem to have any bearing upon the rental of water heaters. It so happens that only one of the reverts resulted from a rented home, and in this instance the customer moved outside the territory. Had the customer moved to another home in our own territory he would have paid the remainder of his $2 per month rental charge and we would have reconnected his water heater in his new home at no extra charge. He would merely sign a contract for an additional year.

While we have no definite basis to determine the actual life of these water heaters, we have found to date that after four years of installation the servicing has been very small and that the heaters, to all intents and purposes, are just as efficient as when originally installed. In offering these to our customers on the seven-year rental plan one should keep in mind that we only recommend and promote the sale of copper tanks for this territory. Galvanized tanks on a rental plan should be studied very carefully.

Of course, if after this plan has been in effect a number of years we find that we do get reverts, it will doubtless be necessary to have some plan of either renting or selling reconditioned heaters at a discounted price.

"What has been the reaction of the public and dealers in your territory?" The reaction of the public has, we feel, been justified through the increased installations since this plan was announced. Customers have been very much interested in it and it appeals to them. Prospects who have openly expressed their desire for a heater in the past, but who have been afraid to assume the extra obligation of a water-heater purchase, have been favorable to the rental-purchase installation.

As far as the dealers and contractors are concerned the majority of them are very friendly to it. For the most part dealers do not carry any water heaters and contractors are looking for the extra wiring it brings to them. It opens up an easy way to increase their earnings through commissions and installations without any expense or carrying charge to them.

The keynote of dealer co-operation is announcing the plan of any campaign to them prior to its public announcement and getting their views and co-operation.

Any feeling that has sprung up recently toward any merchandising activity of our company has come from an outside source and not from the dealer or contractor.

From a study of conditions in more metropolitan areas, we know that certain points in our plans would not be as successful where larger and more substantial dealers are located. In our territory any plan to increase the business of the contractors is of paramount importance to them. Rental purchase is no more or less than a bid for business under existing conditions. On a sound and systematic plan we feel that it is as beneficial to the customer as to the company if watched carefully.

What rental is to the electric hot water heater, we feel "free wiring" is to the electric range. Free wiring has pegged the downward trend of range sales materially. We mention free wiring in this article merely to show that we look upon these two policies as ambassadors for sales and not merely to substantiate the rental plan as being the best policy for all major appliance sales in general.

Free wiring, we believe, has accomplished just as good a job in selling electric ranges as rental-purchase did for electric hot water heaters. At the present time we do not contemplate the rental of electric ranges, although this does not mean we will not rent ranges at a later date.

Following the peak of our range sales in 1930, sales began to drop steadily throughout 1931 and by the end of the first six months of 1932 had shown a decrease of about 66 per cent over the corresponding period of 1930. Actual sales for the first six months of 1932, by far the best range months of the year, were only 78. With water pouring over our dams to waste we felt some plan should be devised to increase our kilowatt-hour consumption through range users.

A range campaign was set up, built around a good family range that could be installed for $98.50. More than 140 ranges were sold in six weeks, beginning in September, 1932. In November a similar campaign was run for four weeks, in which 62 ranges were sold, making a total of 202 ranges in ten weeks, as against 78 in the first six months under the old plan.

During this same period dealer range sales, which in the past were almost nil, added 24 more ranges, with excellent prospects for future activity. Most of these 24 ranges were sold by the dealers from our stock, with the consequent commission and installation charges accruing directly to the dealer.

Furthermore, 35 ranges stored in barns and attics, because people felt they could not afford wiring in their present abode, were put back onto our lines under our free wiring offer. We feel that free wiring actually put 150 ranges on our lines in the last half of 1932 that otherwise would not have been there. Our average cost to install was about $39 a range, which business was all turned over to local contractors. With the average range adding $45 to $50 each year, we feel that at most we have donated the first year's consumption, with each succeeding year's revenue practically all gain.

Any plan that is sound and practical which will permit customers to enjoy more easily and quickly the benefits of electricity is not only good business for the customer but is good business for the utility and dealer alike.

Until such times as our dealers, including department stores, are in a position to handle a greater percentage of appliance sales than they are doing in our territory today, we feel that we must provide every sound and practical stimulus to increase the sale and use of electrical appliances.

As far as the dealer and utility relations are concerned, we look upon the situation as one of utmost co-operation—no other policy can endure satisfactorily to either party.

▼ ▼ ▼

Four-Point Program for Utility Legislation*

By DAVID E. LILIENTHAL

Public Service Commissioner, Madison, Wis.

TWO things seem to me clear: First, that abuses of the relationship between holding companies and operating companies directly violate the principle which underlies the operation and the regulation of public utilities, namely, that this is a public business and that the management is impressed with a trust for the public. Second, that the holding company, regardless of whether it is a public utility in the constitutional sense, is so closely allied to the interest of the consumer and the public investor that it must be subjetced to some measure of public control to protect the interest of the consumer and of the investor.

In essence, what the Wisconsin Legislature has done about this was to declare that all transactions between any operating public utility and corporations affiliated and inter-related with such operating utilities, by reason of stock control or otherwise, are invalid unless established to be in the public interest and approved by the public service commission of the state. Under such a statute all the various relationships between operating companies and holding companies must be scrutinized by the state commission and are illegal unless such relations are consistent with the public interest.

Because of the importance to regulation all over the country of the outcome of the Illinios situation at the present time I submit for your consideration a four-point program of essentials for legislation to meet the problem of public utility holding companies. A minimum program, in my judgment, requires:

First—An express and broad grant to the state commission of jurisdiction over all transactions between any operating public utility and any affiliated company or interest, "affiliated interest" to be defined very broadly to include not only a company which controls an operating utility, but any company having common directors or, in fact, subject to common control. Properly administered, this grant of authority would prevent holding companies from putting unreasonable burdens on the consumers in the way of excessive management fees, stock-selling commissions and expenses, or financial charges, or through other similar methods.

Second—That utilities be prohibited from loaning their funds to a related company, except under strict control of the state commission. Siphoning of resources out of the company which serves you into outside hands should stop. All the resources of the company should be devoted to the improvement of service, the reduction of rates and the fair compensation of the investor.

Third—That the state commission require, except in very unusual circumstances, competitive bidding by investment bankers where any public utility seeks to issue and sell senior securities, especially where the bankers who propose to buy the securities are in control or are affiliated with the public utility issuing such securities. Protection of the rate-payer requires that a public utility receive the highest price for its securities which can possibly be obtained. Single-banker control of financing should, in general, give way to open and competitive bidding.

Fourth—That public utilities be forbidden to pay dividends on common stock at the expense of adequate provision for depreciation and other reserves, or where such dividends endanger the capital structure of the utility, and that the state commission be given authority to enforce such a requirement. The integrity of the physical property which serves you as consumers, and the integrity of the capital structure which led you to invest in a public utility, must be preserved against raiding.

Confidence of consumers and investors can only be regained by a return to the fundamental that public utilities are a public business, and that the concrete evidence of that return must be the enactment of more effective public control and its vigorous and intelligent enforcement.

*Excerpts from recent address before League of Women Voters of Cook County at Chicago.

Spot and Line Welding of Stainless Steel

By WARREN C. HUTCHINS
Industrial Engineering Department, General Electric Company

Cross-sectional micrographs of spot weld on two sheets of 0.037 annealed stainless steel (18-8).

A—Weld area magnified 50 diameters.

B—Fusion line of two sheets magnified 1,200 diameters

C—Boundary between parent and fused metal magnified 1,200 diameters. The boundary is not a clear distinct line, but is just visible between the parallel white lines.

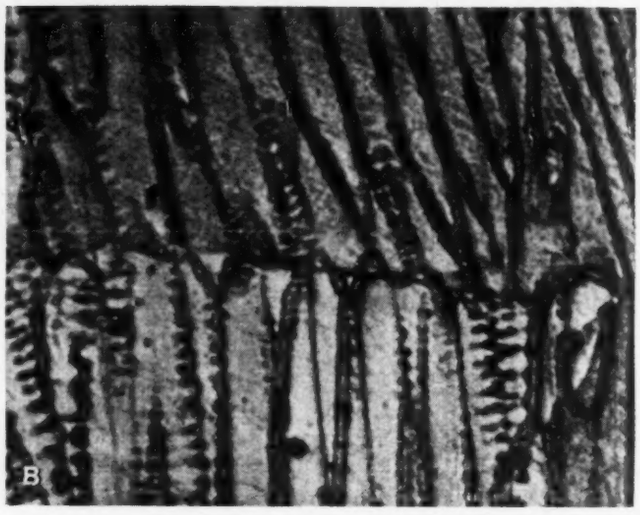
THE peculiar characteristics of stainless steel have for years hindered its general use, in that stainless steel could not be welded so as to maintain its full strength and corrosion-resisting characteristics without subsequent heat treatment. It can be gas or arc welded, but to restore neat appearance, full strength and corrosion resistance such welding must be followed by expensive buffing and heat-treating operations. The use of "Thyratron" control for resistance welding has apparently solved these problems and stainless steel can now be either spot welded or line welded, maintaining its corrosion-resisting characteristics and physical properties without need of further treatment or buffing.

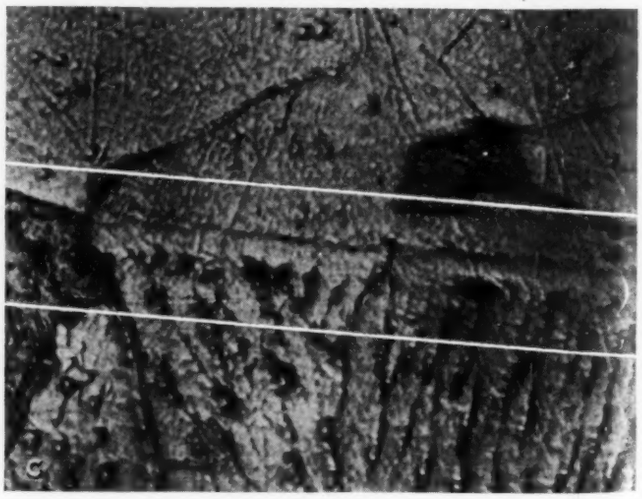
If stainless steel is spot welded on the conventional type of welder, the time of power application being one-half second or more, the metal at the point of fusion reaches approximately 2,500 deg. F., the temperature at which this metal is plastic. In all directions from the weld there will be a zone which reaches only the critical temperature at which carbide precipitates and the various metals separate to form a mixture with the carbon.

It has been proved that if the metal is quickly heated to a temperature at which the carbides precipitate readily —1,400 to 1,500 deg. F. or more—and is quickly cooled, all in a short enough time, the desirable physical properties of the metal and its corrosion-resisting characteristics will be maintained.

When Thyratron control is used with a spot welder and the time of power application is adjusted for only one cycle or 1/60th of a second, a weld of excellent quality can be made on stainless steel without carbide precipitation or discoloration on the surface of the steel (see illustration). The strength of the spot weld is sufficiently strong to pull a hole in one sheet or the other when the two welded sheets are torn apart. Also the weld can be twisted through an angle of 90 deg. or more before failure occurs.

The approximate power required for the weld shown





Some Characteristics of Stainless Steel

1. Physical properties.
   (a) Annealed:
   Ultimate tensile strength, lb. per sq.in...80,000 to 100,000
   Elongation in 2 in., per cent..... 68
   Reduction in area, per cent..... 65
   (b) Cold worked:
   Ultimate tensile strength, lb. per sq.in..150,000 to 200,000
   Elongation in 2 in., per cent..... 18

From these data it is obvious that stainless steel is very ductile and suitable for working into practically any desired shape.

2. Electrical resistance is seven to twelve times that of mild steel.

3. Stainless steel is annealed or softened by quenching from approximately 2,000 deg. F. For thin gage metals air quench is sufficient.

4. If the temperature is raised to 1,400 or 1,500 deg. F. a radical change takes place in the grain structure of the steel in only a short time. Chromium carbide precipitates, leaving the metal with an appreciable reduction in chromium, rendering it non-corrosion resisting. When at this critical temperature the iron, chromium, nickel and carbon will become a mixture and, when cooled, the physical strength of the metal will be reduced appreciably. If this same metal, however, is heated to a temperature of approximately 2,000 deg. F. and quenched, all of the desirable characteristics of annealed stainless steel can be reinstated.

was 26,000 amp. at 1.7 volts (measured by oscillograph and not including losses in welding transformer) and the time of application one cycle. The total energy consumed for one spot weld was 737 watt-seconds, which means that 2,400 spot welds on this stock would consume only 1 cent's worth of power at 2 cents per kw.-hr.

When line welding stainless steel Thyratron control is equally essential. The circuit should be accurately interrupted so as to have power on for only one cycle and off two cycles. The metal sheets travel at a constant speed between the two rolls of the line welder, producing a series of overlapping spot welds. When Thyratron control is used and water is sprayed on the work and rolls each one of the overlapping spots is completed without heating the outside surfaces of the two plates to an injurious or discoloring temperature. This method permits consistent line welding of gas-tight seams at 80 in. per minute.

There are two very satisfactory methods of testing these welds:

First—After line welding two sheets together in the flat position the sheets are torn apart. When Thyratron control is used to interrupt the welding circuit line welds on stainless steel invariably tear the metal outside the welded area.

Second—A pair of rectangular or square sheets are line welded along each of the four sides, totally inclosing a space between the two sheets. A pipe nipple is welded on one side of the test specimen at the location of a small hole drilled through only one sheet. This permits application of water pressure to the inclosed space between the two sheets. When water pressure is applied the specimen will assume the shape of a pillow, bending the metal approximately 90 deg. along each outer seam. When properly welded a high pressure must be applied before failure occurs. Failure will occur along the line where the metal is bent at 90 deg. Specimens of 0.024-in. stainless steel, 2 in. wide and 12 in long, will not fail below 3,000 lb. per square inch water pressure when properly welded with Thyratron-controlled welders.

A large number of Thyratron-controlled spot and line welders are in service for large production of stainless steel, gas-tight containers.

Thyratron control has eliminated one of the most serious variables in resistance welding with which one has previously been forced to contend—the inaccuracies of control devices with respect to time of power application. The proper application of Thyratron control will open fields for resistance welding which have to date been untouched and, when applied to resistance welding machines already in service, welding mild steel, terne plate and many alloys besides stainless steel, will insure welds of improved quality at greater and more economical speeds.

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Faulty Lubrication Causes Most Motor Troubles

By R. H. PARRISH
San Antonio, Tex.

Data collected by the writer while in charge of repair work in a shop doing nearly 75 per cent of all the electric motor repairs in a city of about 250,000 serves to show the real seriousness of motor-bearing wear. The accompanying analysis of all causes for heavy motor repair bills is believed to be representative. The relative percentages of the table may vary in different places due to local conditions. However, it is important that the greatest single cause of motor burnouts, the most expensive of common motor troubles, is bearing wear. This is a problem of proper lubrication. Bearing wear is of a cancerous nature, inasmuch as it shouts no warning, but silently and continuously goes on until it shows up when the rotor "swipes" its stator and the "jig is up." Such wear results from lack of lubrication, improper kind of lubricant and from abrasives or other grit and dirt in the lubricant.

Causes of Trouble		Per Cent of Failures
Faulty oiling 70 per cent	Bearing wear	60
	Oil-soaked windings	10
Natural causes, such as old age		15
Overloads		10
Miscellaneous other causes		5
		100

Lubricants recommended by individual motor manufacturers should be used. Expert advice may also be obtained from local oil refineries or supply houses anxious and ready to give such information. Under ordinary operating conditions ring-oiled housings should be drained at least every 1,000 operating hours. Clean out with kerosene or regular flushing oil, dry with compressed air and refill. Oil filler caps, plugs and bearing end covers must be kept sealed from dirt, dust and other abrasives. Oil rings should be inspected at each starting of large motors and periodically on smaller motors to make sure they are turning. Change lubricant with changes in extreme seasonal temperatures, such as from summer to winter, and vice versa. The oil should be drained before moving a motor about to prevent the oil from spilling onto its winding.

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Load Control Reduces Peak Demands

Process-steam-using industries developing a portion of their power frequently find it desirable to limit the power demand on outside sources. This may be done, reports* S. H. Hemenway, Westinghouse Electric & Manufacturing Company, by arranging some turbine

**Before the Technical Association of Pulp and Paper Industries, New York City.*

in the plant to operate in response to a load-control device. "At one plant such a load control, consisting of a wattmeter element, operates the speed changers on two of their four turbines to keep the load carried by the tie line substantially constant. Any tendency for the tie line to pick up load causes the load control to act on the turbine governor to increase the turbine load, thus reducing the tie-line load to the desired value. By forestalling the establishment of higher peak-load demands considerable savings in total power cost are sometimes effected."

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Buried Cable Simplifies Rural Substation Design

By L. M. GROW
Electrical Engineer
Central Ohio Light & Power Company, Wooster, Ohio

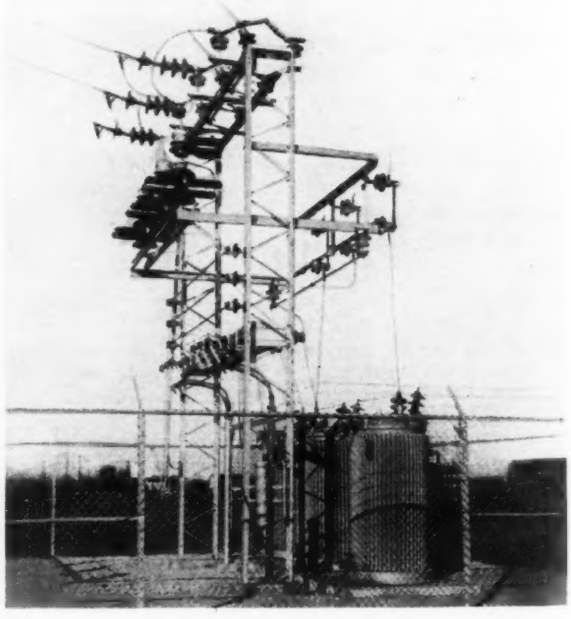
For supplying electric service to two rural communities and the surrounding farm territory of approximately 40 square miles the Central Ohio Light & Power Company has constructed near Wooster, Ohio, a 300-kva., 22,000 to 6,900-volt substation of simple and economical design. Exclusive of transformers and the 25-kv. lightning arresters, which were on hand, the total cost of the station, including overheads, was $2,564.91. Some of the larger material items, not including freight and cartage, were as follows:

Land	$230.00
Steel structure	125.00
Foundations, slab and gravel	110.00
Air break switch, 200 amp., 25 kv.	130.00
Expulsion fuses, 25 amp., 25 kv.	106.50
Expulsion fuses 7,500 volt	60.00
Fence	205.98
Underground cable	124.90

The use of buried underground cable for the outgoing lines in place of overhead take-offs materially simplified the layout and decreased the weight of steel required both on account of the smaller number of members and the lower strength of these members allowed by reduction of line pull-off forces. The cable consists of three No. 4 solid copper conductors, each insulated with 8/32-in. "Kerite" insulation and covered by a 5-mil bronze shielding tape. All three conductors are covered with a heavy sisal and impregnated jute covering, which makes the cable suitable for burying directly in the trench. No potheads are used on this cable, the terminals being made by fanning out the conductors and removing all covering except the "Kerite" insulation for a distance of 24 in. from the crotch to the copper terminals. The crotch is well built up with "Kerite" tape and then covered with friction tape and given four coats of good quality waterproof paint.

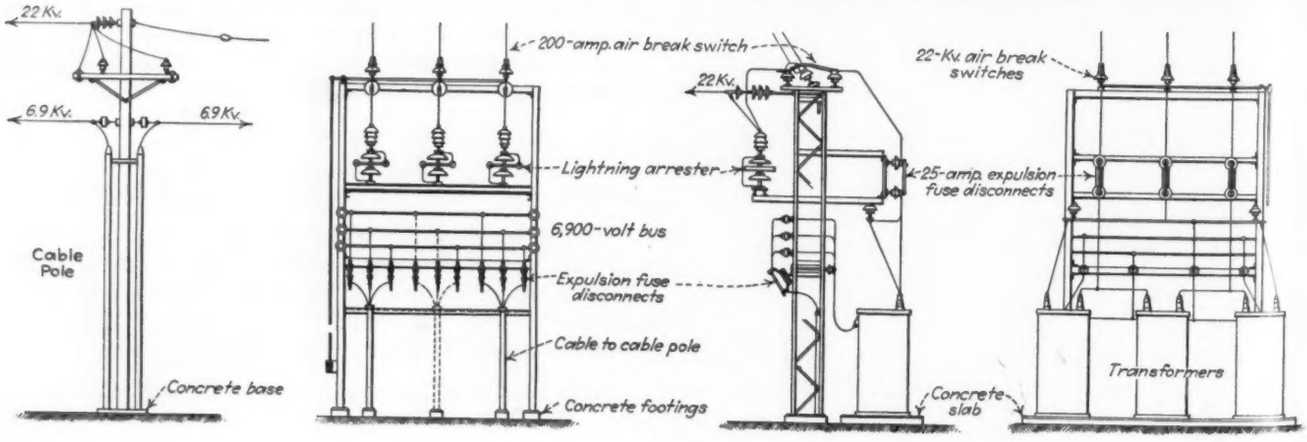
The steel columns are 22-in. Weltrus type B sections, each 25 ft. long, 5 ft. of which is set in the ground in a concrete footing. Footing holes were first dug and a pad of concrete approximately 4 in. thick poured in the bottom of each, keeping equal top elevations. The following day the columns and two Weltrus beams were assembled on the ground and then raised into position, being held there by four ropes, while the remainder of the concrete was poured and allowed to set.

The transformer slab is large enough to accommodate larger transformers when these are necessary. Sufficient space is also provided within the fence inclosure for addition of induction regulators and automatic reclosing oil switches to install these in the future.



Light-weight substation structure allowed by buried cable secondary take-off

On the cable pole 7,500-volt lightning arresters placed on each of the outgoing circuits protect the secondary side of the substation.



Light for Safety and Health

By W. D. KEEFER*
Director Industrial Division National Safety Council

Reduction in accident hazards by good lighting in industry approximates $235,000,000 a year.

Health an indirect asset.

STUDIES have not yet been carried sufficiently far to indicate in just what percentage of accident cases illumination should be charged either as the proximate or as a contributing cause. Nevertheless, it seems reasonable to estimate that the number of times it is charged as the proximate cause is much less than the number of times it is charged as the contributing cause. Accordingly, the results of these studies when completed may indicate faulty illumination as the proximate cause of, say, 5 per cent of all industrial accidents, and as a contributing cause of, say, 20 per cent of all industrial accidents. These estimates, though not as favorable for the illuminating engineer's purpose as the figures usually quoted, still indicate that faulty illumination is a definite factor in accident causation, and any money which an industrial executive can spend in improving the illumination in his establishment could amply be justified on a humanitarian basis. In fact, any improvement which will prolong life, decrease misery and suffering among workers and their families is very much worth while.

Just as efforts have been made to evaluate precisely the number of accidents that could be prevented by good lighting, similar efforts have been made to calculate the exact amount of money which would be saved. If we could answer the first of these two questions it, of course, would be simple to answer the second one.

It is generally agreed that more than 1½ million (1,567,000) workers were killed or seriously injured in the United States in 1931. On the other hand, comparatively few people realize that, on an average, each of these disabilities cost the employer $200 in cold hard cash. This represents the sum paid for compensation, for doctor bills and for hospital fees.

Nor is that all. That is simply the out-of-pocket expense that is accounted for by company bookkeepers and auditors. For in addition to that sum recent studies made by the Travelers Insurance Company indicate that there is an indirect and indefinite cost that never appears on the books, but which, nevertheless, must be paid by the company. This indirect cost includes the value of lost production, of labor turnover, of damaged machinery and materials and other items which after careful study are calculated to amount to at least four times the direct cost. In other words, on the average, the company loses about $1,000 every time a worker suffers disabling injury. Thus, the total cost of accidents in American industry each year amounts to more than 1½ billion dollars ($1,567,000,000). If it could be said that 15 per cent of this amount would be saved by good lighting the saving would amount to approximately a quarter of a billion dollars ($235,050,000). On a 5 per cent basis the saving would be $78,350,000.

It is indeed unfortunate that neither of these figures can be supported by definite statistical data. Nevertheless, the amounts involved are so huge it is clearly evident that any amount which might be considered as reasonable will very materially offset and probably exceed the cost of installing, operating and maintaining good lighting as recommended by reputable illuminating engineers.

Illumination and the health of industrial workers

In addition to the fact that adequate illumination helps to decrease frequency as well as the cost of industrial accidents, it also helps to conserve the health and promote the comfort of industrial workers.

Health and comfort, of course, involve the whole question of seeing, which is a combination of vision and lighting. Vision can be improved or "sharpened" by optometrists, oculists and ophthalmologists. On the other hand, lighting experts with an understanding of the physiological and psychological factors of their work can accomplish a great deal more than the average safety or personnel man realizes.

From the standpoint of fatigue, it is estimated that one-quarter of the consumption of bodily energy is due to seeing, even with adequate lighting and normal eyesight. Thus, when the lighting is improper or inadequate, the consumption of bodily energy is unnecessarily increased and the worker suffers fatigue more quickly than should be the case. Although fatigue cannot be expressed quantitatively, extensive tests which have been made indicate not only that good lighting protects the individual through his ability to see better and more quickly, but that also by reducing fatigue it keeps him more active and alert. For example, an automobile driver commonly grips the steering wheel tighter when driving in a fog or at night on a poorly lighted highway than on a well-lighted one. In other words, an inadequacy of illumination is manifested in the useless expenditure of muscular and nervous energy.

Furthermore, inadequate lighting may actually harm the eye by causing inflammation of membranes, eyestrain and headaches. As explained by Luckiesh and Moss, the evolution of the human eye through countless ages has taken place outdoors and the eye has adapted itself so it probably functions best under an intensity of illumination of about 1,000 foot-candles. This is approximately the condition found under a small tree on a fairly clear midsummer day. Fortunately, the eye adjusts itself readily to great variations from this ideal intensity, but now that millions of persons are required to work indoors, where the intensity of illumination is nearer 2 or 3 foot-candles, it is not surprising that their eyes do not work at their best and that they become more and more defective.

**Abstract of paper presented at the lighting conference at Case School of Applied Science, February 8, 1933.*

The psychological effects of good lighting may be of comparatively minor importance from a purely mechanical point of view, but to any one responsible for industrial relations in industry they are very much worth consideration. From this standpoint it must be recognized that cheerful and comfortable surroundings in a plant have much to do with the worker's attitude toward his job and also toward his employer. Since it is readily conceivable that poor lighting may cause annoyance and an unfavorable emotional reaction among the workers in a plant, it is quite likely that the cost of good lighting can be justified in many cases by a consideration of the psychological benefits alone.

Thus far, all attempts which have been made to evaluate precisely the comfort and health benefits of good lighting have been even more difficult than those dealing with industrial accidents. Health and comfort are in themselves so complicated, so intangible, flexible and variable that it has been impossible to express their values in terms which are simple and which at the same time carry conviction. Nevertheless, in spite of our inability to make comparisons in identical terms, when one takes into consideration all the benefits to be derived from good lighting, including decreased accidents and accident costs, improved health and comfort, increased production and decreased waste, he cannot fail to be convinced that money spent for good lighting will prove to be a rich dividend-paying investment.

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Extreme Operating Range for Automatic Battery Charging

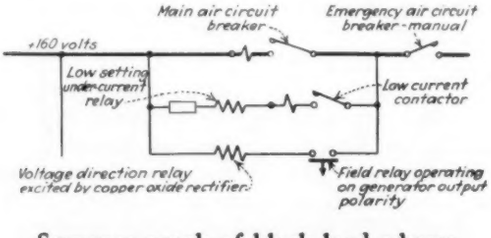
By E. A. WYATT and R. C. SAMUELS

Commonwealth Edison Company and General Electric Company, Respectively, Chicago

From 9 to 11,700 amp. This is the operating range under fully automatic control designed for the truck battery charging substation in the new Northern Service Building of the Commonwealth Edison Company. The upper limit at present is 7,800 amp. because only two of the ultimate three machines are installed. When the installation is completed it will be possible to charge in this garage 125 of the 370 electric trucks operated by the company.

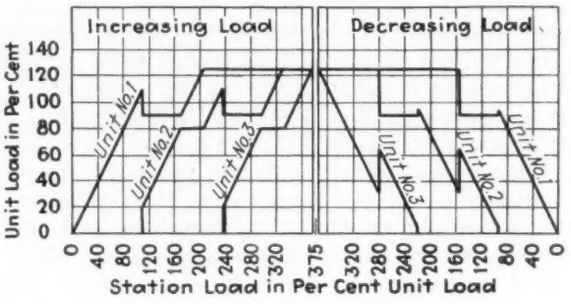
The extreme range of operation is obtained by sequence starting and stopping of the machines and by a parallel arrangement of large and small output circuit breakers. The sequence is not fixed, but any one of the machines may be selected as first, second or third as appears desirable from the counters of machine operating hours on the switchboard. Thus an even distribution of operation may be secured.

The synchronous motors start across the line on 2,300 volts. As the speed of the unit rises the shaft-end exciter takes on the generator field and the generator energizes the field of the motor which swings into synchronism. The generator output is checked for polarity against the voltage direction of a small copper oxide rectifier excited from the a.c. supply before the output air circuit breakers close. Each generator can deliver 125 per cent full load for two hours, making an ultimate station capacity of 11,700 amp. On each machine bearing is a thermal relay (the three in series) that will lock the unit out if overheat develops. Also, mounted on the frame of the generator is a self-calibrating relay watching over the temperature of the field coils.


Main air circuit breaker
Emergency air circuit breaker - manual
+160 volts
Low setting undercurrent relay
Low current contactor
Voltage direction relay excited by copper oxide rectifier
Field relay operating on generator output polarity

Sequence graph of block load scheme

One unit operates until slightly more than its full load is reached. It is then followed immediately by the next unit, which carries all load in excess of the predetermined load of the first. When more than one unit is operating the leading unit or units will hold constant load while the trailing unit takes care of all variations. As load drops off, trailing units unload and shut down successively as their respective loads reach 100 amp. The leading unit, although capable of delivering 4,000 amp., will not shut down automatically until its load is 9 amp. or less.



Load range and polarity control

The main air circuit breaker of 4,000 amp. capacity obviously cannot be set accurately for very small currents. If the load remains below 100 amp. for a predetermined time (up to twenty minutes) this breaker opens, but the circuit remains closed through the low current contactor, which by means of the low setting undercurrent relay can be calibrated for very small current flow. The contactor remains closed until the load has held below 9 amp. for a certain time setting (also up to twenty minutes), when the machine shuts down.

The substation is in charge of the operating department and only periodic inspections are necessary. Starting of the machines is done by the transportation department attendant from the garage floor. The automatic control fully protects the substation equipment from any emergency and sounds an alarm in case of serious trouble. The complete station can be operated under manual control in case of emergency.

The automatic equipment has special features incorporated in the control that probably make it the most complete installation of its kind now in service. Additional investment cost for automatic control equipment is but nominal, and it is estimated that in a reasonable period this will be offset by economy from elimination of full-time attendance of station operators. Other economies will also be made by increased plant efficiency, as the leading units carry full load to obtain a minimum number of machines in operation. Two-wire design eliminates a possible condition of unbalance, so that constant voltage is maintained on the charging bus regardless of variation of demands.

Organization and Management Important in Power Station Economy

By C. D. ZIMMERMAN

Assistant Superintendent of Production
Ohio Edison Company, Akron, Ohio

CONTINUOUS output of energy is understood by operators of generating stations to be their prime object. An essential characteristic of plant organization must therefore be stability. And the bases for this are good working conditions and high employee morale. Unrest, dissatisfaction and consequent poor work can almost always be traced to the head of the department concerned or, if general, to the plant head, so that it is the first duty of management to keep capable men at the heads of departments. The manager should create in each plant an attitude of general good will, pride in the plant appearance, pride in results and feeling that the entire personnel is striving for continuous improvement.

Too much standardization or rigidity of organization is not advisable as best results are obtained by fitting the work as far as possible to the strongest individuals in each organization. Standardized routines often make operators too dependent upon these routines and orders from superiors, with the result that they are incapable of handling emergencies.

Proper initiative in plant superintendents has a pronounced effect on costs. Two extremes of this phase are: (1) All initiative in the plant superintendent and few direct orders to him and (2) no initiative in the plant superintendent and all direct orders for his action. In the first case best results are not obtained because no advantage is taken of management methods beyond the ability of the plant superintendent to develop and inaugurate and, in the second case, the superintendent sits back and waits for orders. The best system is a combination of the two.

Present and future conditions call for a type of plant chief different from some years ago. In the large plants of the present day several departments require really scientific operation in a considerable degree and at least one demands expert technical knowledge in its members. The present plant superintendent therefore must be more of an executive in charge of a number of specialized activities than formerly, and although he should direct the work of each department and feel that it is his responsibility to see that all operating problems are solved, he must realize that he cannot be exclusively identified with each problem solution or improvement in practice.

Simplicity in organization, as in design, results in lowest costs. Complicated organizations consisting of many specialized departments result in too many department heads, classes of work and assistants, and also lead to cumulative effects on clerical work and lost time, which materially increase costs. It is easy enough to note a shortage of man-power or wrong use of the available force, but detection of some excess is more difficult.

Some plants have made a material saving by giving the lowest classes of labor no work classification and using them on a variety of work. This is not carried beyond a certain point as best results are obtained from higher classes of workmen by giving them definite classifications as they require special training and take pride in their titles and achievements. Material reductions in costs have been made in a number of plants by using operators for clean-up work, painting and some maintenance, especially during low load periods, but also during other hours when operation does not require continual attention.

Centralized management

In cases of large companies controlling a number of plants considerable gain can be made by centralizing management, cost and efficiency work. In these cases the cost per plant is decreased and the gain in economy of each plant is increased, as the most capable and experienced men are made available for each. The two main benefits of this centralization are: (1) Standardized fundamental methods are developed which keep each plant close to the best obtainable performance, practically regardless of future changes in personnel, and (2) more time is available for systematic research leading to improved methods.

It is very important in this connection to avoid detailed standardized methods of operation because they remove the necessity for initiative and thought on the part of operators. They retard development from this source and make operators less capable in emergencies.

No change in plant operating organization need be caused by a centralized test or results department. No authority is taken from the division superintendents or managers, whose work continues as before.

The value of a test department is not in running miscellaneous tests, but in developing improvements by research in operating practices. Economy gains thus attained pay the cost of the department many times over. Test or results departments, whether separated in each plant or more or less centralized, are essentially fact-finding and technical departments unconnected with operation except in an advisory way. A great deal might be written on centralized departments of this type and on the methods of recommending changes in operation so that these changes will be adopted in a whole-hearted manner, yet practice shows that the successful method is peculiar to the individual and the case in question and general formulas of procedure are not of great value.

Some changes require indirect suggestion and considerable patience and time to accomplish results, but often too much effort can be made along this line as it is easy to stray afield and get nowhere by complicated and long-delayed methods of suggestion, whereas if equal effort had been made to be thorough and bring all the facts bearing on the case in question to light the solution would be obvious to all concerned. After all, results are primary and the method secondary and the sole requisites for men for this work (or any work) are specialized experience and the faculty of producing lasting results.

Operators on test work

Spare operators can usually be used on test work and can even be trained to conduct numerous tests. This is a saving of labor and also has the advantage of bringing operators to a better understanding of the value of test work. All test work, however, should be under the supervision of men trained in this work, as few men not trained in test work realize the sources of test errors and the high probability that tests run without proper precautions are a waste of time and lead to wrong conclusions.

There is one type of log sheet which has been found to have a direct and immediate effect on operating costs. This is the recording of observations of particular phases of operation which, if not continually observed, cause heat losses or damage to equipment. Inauguration of a log sheet requiring periodic observations of these features has never failed, in the writer's experience, to clear up these situations. Examples in numerous plants are: Length of live or flaming coal for certain stokers; type of ignition for most chain-grate stokers: sidewall flame impingement for some pulverized coal furnaces; over-fire draft for some stoker plants; evenness of fire for numerous stoker plants; water analysis, and heater operation (usually in multi-stage plants where there are optional methods of operation).

Competitive and bonus system

Methods of placing complete plants or boiler rooms in competition for good results have been of considerable value, especially where such plants or boiler rooms are of similar design. Bonus systems are only used in a very few of the large power systems of this country. In a number of cases in which they were tried such numerous disadvantages developed that they were abandoned. It is also well to note that the abandonment of such systems is fraught with considerable difficulty. Good scientific management is felt to approach closely to best results of the best bonus systems without risk of the disadvantages that are often disclosed by these systems.

Bonus systems are best applicable to small plants where it is not practicable so closely to follow operation by personal observation or meter records that good results are assured. The tendency of bonus systems is to place all initiative for development and execution of good operation on the lowest paid and least capable of the plant operators. For those cases in which the bonus system is well suited the degree of success depends on its simplicity, on the ease of understanding of the system by the operators and on the justice with which they feel that the bonus system is applied.

In brief, it may be stated that: Proper initiative in plant superintendents has a pronounced effect on costs. Best results are obtained when management methods or suggested changes beyond the ability of experience of the plant operators can be sold to the plant organization in such a way that there is no decrease in their own initiative. Organization should not be too rigid or too much standardized. Complicated organizations consisting of too many subdivisions increase labor and management costs. Centralization of management, cost and efficiency work leads to large savings when this is done without sacrifice of initiative of each plant superintendent. The load factor of the plant personnel can be increased without overworking any one and with great benefit to over-all station economy.

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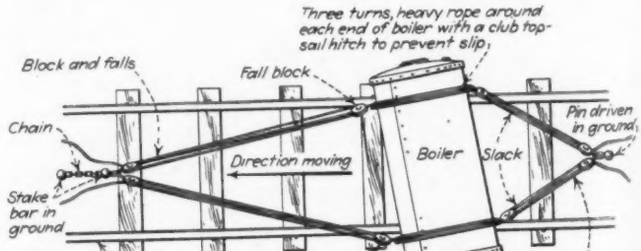
Rapid and Safe Method of Moving Heavy Machinery

By G. F. HARDEN

In building a small steam station in mountainous country far removed from a supply depot it was necessary to unload and place two 150-hp. boilers in quick time 300 ft. from the railroad and with a green crew. A hand car was borrowed from the railroad, run up the line and loaded with hardwood ties. With these a crib was built up to the car level. Two small jacks and block and falls were borrowed from a nearby derrick. The procedure was as follows:

One end of a boiler was raised and a steel rail greased on top was slipped under it, the operation being repeated


Three turns, heavy rope around each end of boiler with a club topsail hitch to prevent slip
Block and falls
Fall block
Chain
Pin driven in ground
Direction moving
Boiler
Slack
Stake bar in ground
Rails greased
Fall block
Preventer guy tackle if on a down grade from R.R. car

Moving 150-hp. boiler on greased rails

at the other end, the boiler being rested on two greased rails. Heavy tie ropes were given three turns around each boiler end and made up with a club topsail hitch to prevent slippage. Two snubbing blocks were made fast in the rear to prevent sliding. Tackle leading from tie bands on the boiler was then made fast to stakes driven in front. By hauling on one end alternately the boiler was moved along the rails, cribbing being built up section by section on a down grade until the boiler reached its foundation location without being allowed to drop below the final installation level. This method has been used with success in handling turbine parts up to 40 tons, and inside buildings the utilization of a slide has been found preferable in many cases to handling by a crane.

Men of the Industry

F. W. MAGIN, formerly executive vice-president of the Square D Company, Detroit, Mich., was elected to the office of president at the recent annual meeting of the board of directors. T. J. KAUFFMAN, formerly president, was elected chairman of the board.

DANA M. WOOD, for many years consultant in hydraulic engineering for the Stone & Webster Engineering Corporation, has established offices in Boston, Mass., for the independent practice of engineering.

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CLIFFORD R. OLIVER, assistant vice-president New England Power Association and general manager New England Power Company, has been elected a member of the municipal electric light board of the town of Wellesley, Mass.

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RAYMOND A. HOPKINS, formerly electrical engineer with the Stone & Webster Engineering Corporation, Boston, and identified with numerous projects, including the recent design and construction of electrical installations for the new anthracite breakers of the Philadelphia & Reading Coal & Iron Company in Pennsylvania, has established himself as a consulting electrical engineer with headquarters at Weston, Mass.

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CYRUS H. LOUTREL, prominent Newark business man, was elected president of the American Transformer Company at the recent meeting of stockholders. Under a reorganization plan, authorizing the merger of the radio and industrial divisions, THOMAS M. HUNTER, formerly head of the industrial division, was made vice-president in charge of sales and JOHN L. SCHERMERHORN, formerly in charge of the radio division, was made vice-president in charge of engineering.

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A. PENN DENTON, who has been prominently identified with the electrical manufacturing industry for the past 25 years, has been retained as consulting engineer to the rigid conduit industry and its technical committee to have charge of all technical work relating to codes and standards as well as to guide a program of research and standardization now being undertaken. Mr. Denton engaged in business in Kansas City, Mo., for 21 years as an electrical engineer and contractor and during this period of time served as a member of the executive committee of the National Electrical Contractors' Association and in that capacity represented the electrical contractors of the United States and Canada on the electrical committee of the National Fire Protection Association. During ten years of service on the electrical committee of that body he served on five of the article committees. Mr. Denton is a graduate electrical engineer of Cornell University, a fellow of the American Institute of Electrical Engineers and a member of the American Society of Mechanical Engineers.

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L. V. Sutton Named Head of Carolina Utility

Louis V. Sutton was elected president and general manager of the Carolina Power & Light Company, Raleigh, N. C., at the meeting of the board of directors held last week. For several

months he has been in Raleigh, going to that city from Mississippi to assist the late Paul A. Tillery, formerly head of the company. In assuming these new duties, Mr. Sutton is returning to the organization with which he first entered the electric light and power industry, bringing to his new executive position a broad experience obtained in public utility operation and management in various sections of the South.

A Virginian by birth and a graduate of the Virginia Polytechnic Institute, he entered the employ of the General Electric Company at Lynn, Mass., where he engaged in testing electrical equipment and in certain electrical construction work. Resigning from General Electric in 1912 after two years of service, he became identified with the Carolina Power & Light Company in the statistical and engineering department and subsequently served as division manager at Raleigh, commercial manager of the company and assistant to the general manager. His next connection was in 1924 with the Arkansas Central Power Company at Little Rock, now the Arkansas Power & Light Company, in the capacity of assistant general manager. When the Mississippi Power & Light Company was formed in August, 1927, Mr. Sutton was offered the position of vice-president and general manager, the office he held until December, 1932, when he resigned to transfer his interests to Raleigh.

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OBITUARY

Charles E. Eveleth

Charles E. Eveleth, a vice-president of the General Electric Company since 1927, died in Schenectady, March 25, after a long illness. Mr. Eveleth had been identified with the General Electric organization for 34 years and in that period of time he engaged in various important engineering undertakings. From 1923 to 1927 he was manager of the Schenectady plant and then as vice-president became associated with C. C. Chesney and W. R. Burrows in the management of the manufacturing department. Two years later he was transferred to the engineering department as vice-president, giving special attention to the problems of the designing departments and works laboratories.

Born in Burma, India, in 1876, where his father was a missionary, Mr. Eveleth came to this country at an early age and received his technical education at the Worcester Polytechnic Institute, immediately after graduation joining the General Electric testing department. He was a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Association for the Advancement of Science and of other technical societies.

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CHARLES M. COOK, president and general manager of the La Porte Gas & Electric Company, La Porte, Ind., died March 11.

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ARTHUR M. COTTRELL, president of C. B. Cottrell & Sons Company, Westerly, R. I., and inventor of the Cottrell electrical precipitators for power stations and smelters, died February 23.

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WILLIAM MCWHIRTER, pioneer of the British electrical industry, died recently in Glasgow, at the age of 81. Among his inventions was the first indicating voltmeter and ammeter patented in 1882. Early in his career Mr. McWhirter was identified with the telegraph branch of the electrical industry, but later became interested in lighting and in association with Norman & Sons (now Claud Hamilton &

Company) he was responsible for one of the earliest installations of dock lighting by means of arc lamps at the Barrow Docks. In 1882 he returned to Glasgow to open a branch of the Norman business. About two years later the firm of McWhirter & Company was established, and finally, in 1897, the present firm of Wm. McWhirter & Sons, Ltd., was founded in Glasgow. Mr. McWhirter was a member of the British Association and other important scientific societies. He was one of the oldest members of the Institution of Electrical Engineers (1880) and was chairman of the Scottish Center in 1912-1913. He was also one of the founders of the Scottish Electrical Contractors' Association. He was a zealous follower of Michael Faraday, and in his electrical researches was associated with many eminent scientists and engineers.

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RICHARD HENRY PIERCE, electrical engineer in charge of illumination at the Chicago Exposition of 1893 on behalf of the then Chicago Edison Company, and a member of the jury of electrical awards at the St. Louis world's fair in 1904, died at Newtonville, Mass., March 16, at the age of 72. At the time of his death he was treasurer of the Atlantic Rope & Line Company, Boston.

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GEORGE H. SCHWARTZ, a pioneer in the electroplating field, and an early associate of Charles H. Brush, died March 20, at his home in Lakewood, Ohio, in his seventy-fourth year. He had established his own plating shop in Cleveland when only eighteen years of age. In 1884 he became acquainted with Mr. Brush and won a wide reputation as co-inventor of many electrical devices. The first dynamo that was invented after months of labor on the part of the two men was put to practical use in electroplating in Mr. Schwartz's shop and remained in continuous use until 1930, when he retired.

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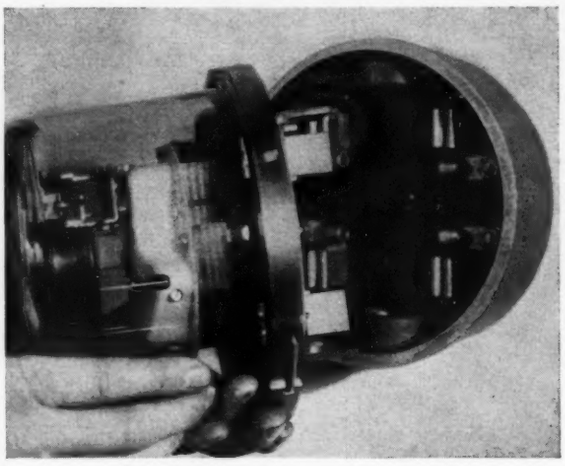
ALPHONSUS L. DRUM, widely known in the engineering field as head of the firm of A. L. Drum & Company, Chicago, and prominent in the development of interurban electric railways and management of utility properties, died at Detroit March 16. He was born in San Francisco in 1875, educated at the Massachusetts Institute of Technology and entered the utility field as manager of the Middleboro (Mass.) Electric Light Company. He became associated with Stone & Webster and served as manager of the Savannah Electric Company and Terre Haute Electric Company for some time. He built the Chicago & Milwaukee Electric Railway and was consulting engineer for the Philadelphia Rapid Transit Company for many years.

New Equipment Available

Universal Socket for New Sequence Meters

Suitable for use with all meters, indoor or outdoor, a new fool-proof, tamper-proof socket has been designed with which all conceivable meter designs may be used. The socket is made by the Westinghouse Electric & Manufacturing Company in only one size, which will take any meter up to 50 amp., thus allowing for economies through the adaptation of present meter stocks. The lowering of energy diversion (indoor) and elimination of missed readings (outdoor) is said to warrant the installation of these sockets with armored mounting on all meters made within the last fifteen years.

When for any reason the meter is not installed or if the service is discontinued the socket with terminal and connections may be sealed with a blank plate, making a water-proof seal. These stockets are also expected to be useful on rural line extensions, for summer resorts or other transiently occupied homes and all other places which are not easily accessible.



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APPROVED RUBBER-SHEATHED CORD for electric lamps, clocks, radios, etc., known as "No Fray," has been announced by the Belden Manufacturing Company, Chicago, Ill. It has been developed to be used in all places where easily frayed or spotted textile covered lamp cord cannot be used satisfactorily. Its all rubber construction gives longer life, it is claimed.

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FOR THE OVERLOAD PROTECTION of fractional-horsepower, single-phase motors the Square D Company, Industrial Controller Division, Milwaukee, offers the new "Knockout" overload breaker. It is designed to mount on and wire into a standard ½-in. knockout. The breaker is of the thermal, melting alloy type. After an overload trips the breaker it is reset from an indicating button; no replacement parts are required. The contacts are silver to silver, single pole, double break. The maximum rating is ¾ hp., 110 or 220 volts, a.c. It is designated as class 9020, type W10.

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Solderless Connectors with Permanent Tightness

Goeller solderless connectors in which permanent tightness is characteristic is announced by Raymond Roth, Inc., New York. In the type G terminal unit this is accomplished by means of the locking ring. The tapered head bolt with slotted tapered nut serves as a locking medium in the type Y terminal unit. This is obtained by a combination of serrated contact surfaces and high pressure. The serrated surface provides line contact which compensates for surface irregularities and cuts through extraneous surface material which might be present through failure to clean insulated conductors properly.

High pressure is very essential. This, combined with serrated contact surface of ample area, assures a perfect connection. In the type G terminal unit high pressure is obtained by the combination of contact of pressure nut and the long seven-degree tapered sleeve, which is slotted in a manner to insure uniform pressure throughout its entire contact area.

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Ball Feeder for Watt-Hour Meters

To facilitate the insertion of the small steel balls in the lower bearings of Westinghouse watt-hour meters W. D. Hodgson, Grand Central Terminal, New York City, has devised a ball feeder. It is a vest-pocket tool, 2½ in. long, holding 25 balls in its reservoir. Pressing a button releases one ball directly into the bearing and avoids all fingering and loss of balls.